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ORGANS AND TUNING

A PRACTICAL HANDBOOK
FOR ORGANISTS

BY

THOMAS ELLISTON

THIRD EDITION
REVISED AND ENLARGED

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ORGANS AND TUNING.

Third Edition.

ORGANS AND TUNING,

A Practical Handbook for Organists :

BEING A TREATISE ON

THE CONSTRUCTION, MECHANISM,
TUNING AND CARE
OF THE INSTRUMENT,

BY

THOMAS ELLISTON,

*Organist of S. Gregory's, Sudbury,
Suffolk.*

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To

MY SINCERE FRIEND,

George Frederick Bruce, F.R.C.O.,

(ORGANIST OF ST. MARY'S CHURCH, BEDDINGTON, SURREY,

LATE ORGANIST OF HOLY TRINITY CHURCH,

WALLINGTON, SURREY,)

AT

WHOSE SUGGESTION

THIS WORK WAS

WRITTEN.

PREFACE TO FIRST EDITION.

IT is a somewhat difficult task to embrace within the limits of a handbook all that pertains to the art of organ building in its many varied forms—if the details are unduly enlarged upon the book assumes a bulky form, loses its character as a handbook, and the thread of the work becomes entangled or broken.

In the following Work I have endeavoured to sail between two extremes, omitting, I hope, nothing essential, and dealing as concisely and clearly as possible with matters which appeared to require explanation.

The Work being a technical one, I have departed from the usual lines by adding sundry memoranda, and a vocabulary of technical terms, which I trust will be found useful.

With regard to the tuning—a subject of very great importance, but so much neglected—I could not rest satisfied with the bare and inadequate skeleton system usually described.

I also felt that—notwithstanding our indebtedness to other nations—it was perfectly safe to keep on English ground, fully believing that the organ builders of our own country can well maintain their position against all comers.

I sincerely hope that this little Work may in some measure tend to the possession of

A GOOD ORGAN, WELL TUNED.

THOMAS ELLISTON.

SIAM HOUSE,

SUDBURY, SUFFOLK,

May 12th, 1894.

PREFACE TO SECOND EDITION.

My first duty and desire is to express my thanks for the hearty reception accorded the First Edition of this Work.

I have carefully revised the original matter, and added somewhat to the text.

The Council of the Royal College of Organists have kindly allowed me to insert their valuable Resolutions and Recommendations, together with the Report of a Committee appointed to deal with "Musical Requirements in Churches."

Correspondents and friends have also been kind enough to place at my disposal other additional matter found in the present Edition.

THOMAS ELLISTON.

SIAM HOUSE,
SUDBURY, SUFFOLK,
March, 1895.

PREFACE TO THIRD EDITION.

IN this Edition I have striven to make the Book more worthy of the patronage so liberally bestowed upon it.

THOMAS ELLISTON.

SIAM HOUSE,
SUDBURY, SUFFOLK,
May, 1898.

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ORGANS AND TUNING.

POSITION OF ORGAN.

An organ erected upon a gallery is in a good position for sound as a rule, but it is not always convenient for accompanying the choir, especially when the gallery is a western one and the choir is located at the east in the chancel. Another drawback is, that too elevated a position is undesirable for the reeds, which, owing to the super-heated air, appear to flatten; but in reality it is the flue-work which sharpens.

The south side of a building is the warmest and best for the wood work, but if the sun streams through the windows into the organ, the exposed flue-work will temporarily sharpen, and the wood work shrink or split. The windows should, therefore, be of cathedral glass, or coloured, the best colour being green, the colour being in the glass and not dabbed on.

An organ should be raised above the floor of the building, and stand on a level platform, which must be well ventilated beneath to prevent damp, or dry rot.

To obtain the best results the organ should have space above and around, and not be packed away in an organ chamber.

The organ in the Chapel at King's College, Cambridge,—upon the screen dividing the nave from the choir—is in the best possible position from a musical point of view.

An organ may be divided, but undoubtedly it suffers in consequence.

It is well for the organ and organist to occupy a side position mid-way between the choir and the congregation: the organ can then be heard well by both, and the organist can equally well hear how each section is singing, and accompany accordingly, so as to avoid that see-saw syncopated effect which is sometimes heard in large buildings when the organ and organist are at one end of the building away from the choir or congregation.

The roof above the organ must be thoroughly sound, and all lead gutters should have sufficiently deep drips where the lead laps and the gutter drops; the gutters should be deep enough to hold a good fall of snow. All rain-water troughs or down pipes must be in order, and the paving or

gravelling around the walls outside should be laid to a fall from the building.

THE FRAME-WORK

should be of good substance, and not mortised and tenoned too much, but slightly lapped together—not too much being cut away—and well bolted and braced; the springing or warping of a rail may cause much trouble with the action until rectified.

THE BELLOWS

should be ample for the full organ, and in sound condition—very few are. Steady wind may be obtained by using French feeders, or auxiliary bellows or feeders, which, being of moderate size and fed from the larger bellows, are practically free from jerking and unsteadiness. Concussions, or concussion bellows or feeders, fixed on the wind-chest or wind-trunk, also steady the wind by giving or taking pressure when unsteadiness arises. Some do not consider them necessary if the wind-trunks and wind-chests are of ample dimensions—which they always should be. The valves in the bellows feeders should be small and plentiful in number, and provision should be made for these, as well as for the valves in the middle board of the bellows, to be easy of access.

The ribs of bellows are inverted to counteract any tendency to variation of pressure which might arise from the ribs folding all one way.

To secure steady blowing, a good plan might be to cut the blowing handle just behind the case, and re-connect it with the other portion by a streak of good steel gig spring: this would relieve any jerking by careless blowers. The leverage of the bellows handle must also be carefully considered. An important factor of unsteadiness is the inertness of large bellows.

It is a matter for some surprise that many organ builders do not seek to improve on the wedge-shaped or diagonal feeder in the same way as the old diagonal bellows were formerly improved upon, *i.e.* by making the feeder board to rise horizontally and bodily, instead of being hinged at one end; thus exactly doubling the throw of wind.

There is a patent double-blast circular bellows used by smiths in which the feeder is not only made in this way, but of the full size of the bellows, and, by being also double-acting upwards and downwards, gives at *each* stroke a blast of wind equal to the capacity of the entire internal area of the bellows. If organ feeders or bellows were constructed on this plan, they would throw four times as much wind as at present. The patentee would have to be considered,—and the leverage of the blowing

handle would have to be adjusted to avoid jerking. Such a method would answer well for small organs as it is the feeders which regulate the supply of wind, if the pace of blowing is left out of calculation.

Ordinary bellows feeders are best lifted by iron rods bent at each end and pointed, the points hooking into hard brass or gun metal cups. The rods must be clear of obstruction, or they will jerk off in using.

Waste, exhaust, or relief pallets or valves of bellows are of three kinds: a valve upon the outside of the upper board tipping up and discharging surplus wind; a valve upon the inside of the upper board, pushed open when the bellows is full by a screw, or pulled by a tape attached to the middle board; and a valve in the middle board discharging into the feeders, pulled by a tape passing through the upper board, and secured (after adjustment) by a peg.

The manufacture of automatic organ blowing engines or apparatus is a trade by itself.

A water pressure of at least 35lb. to the square inch is desirable for blowing by water. When so blown, two pairs of bellows are required, the first, operated by the engine, having square-rising feeders and an ordinary waste valve, the second bellows being provided also with feeders for use by hand in

case of failure of the engine or water. These bellows are connected by a wind trunk, and a cut-off slide (automatically controlled by the height of the second bellows) is inserted at the inlet to the second bellows. When this bellows is empty the slide is open, closing gradually as the bellows rise. A somewhat similar automatic device exists in connection with the engine bellows and the water supply, by means of a chain attached to a weight resting upon the top of the bellows. The lowering of the weight by the falling of the bellows admits the water, causing the engine to blow quickly, and as the bellows rise the water is cut off, the engine blowing slower or stopping. The weight and chain can be lowered or lifted by a winding arrangement near the key-board for starting or stopping the engine. The engine bellows are weighted slightly in excess of the second bellows so as to give the latter a little start of the engine bellows; this makes the engine bellows wind ever ready to seek admission to the second bellows; it also ensures that this bellows, which feeds the organ, shall be the first to fill and the last to empty.

The lower the water pressure is, the larger the engine requires to be, and the sizes of the water pipes and stopcocks should be regulated so that only just sufficient water is admitted, passing freely from the engine, as, if too much water has access, the check will cause knocking.

Most hydraulic engines make a little noise at starting, but this can be avoided to a great extent if, in starting the engine, care is taken to lower the weight slowly. Provision should be made for drawing off the water from the mains in frosty weather, and the water pipes should be put deep into the ground, and protected where they are exposed, and also provided with proper valves and stopcocks in case of accident.

Gas engines are rather noisy by reason of the explosions, and are not quite so economical in power, as they have to continue running at a fair speed whilst in use. Their action, as far as blowing is concerned, may be controlled by the bellows operating the strap on and off fast and loose pullies, but they do not blow fast and slow as hydraulic engines do.

SOUND-BOARDS AND WIND-CHESTS

should be of ample dimensions both as to length and width, so as to give each pipe plenty of speaking room, and not so much crowding of pipes and grooving off resorted to. Each pipe should stand over or as close as possible to its wind or channel.

The wind-chest is an air-tight box or chamber having channels above the valves or pallets, one for each note; when the pallet is opened the wind runs

along the channel, and is free to reach the pipes belonging to the stops which are drawn.

The lower notes in organs of more than moderate size should be provided with double or duplicate pallets, for the purpose of getting a good supply of wind, to facilitate and shorten the conveyances to the front and other pipes, and to ease the touch by so regulating the action that one pallet opens slightly in advance of the other.

The front boards of wind-chests are frequently cut in two for greater facility in obtaining access to the pallets when only slight repair or attention is required.

The upper board (and sometimes the table) is chased around the pipe holes on the surface next the slide with a V tool, the chasing extending to the edge of the board: this should allow any small leakage of wind to pass off, and prevent it running along the slide to another note.

Thick bars are inserted at intervals in the length of the wind-chest for strength, and also to form screw-holds for securing the upper boards.

Wind-chests are sometimes made without slides, having a separate pallet for each pipe, but they are not always desirable, although they possess the advantage of immunity from running.

The order of stops upon the sound-board usually follows the order of the drawstops.

Organ builders would do well sometimes to use wood other than mahogany for the upper boards, because the acid in the mahogany corrodes and sets fast the screws, or they should use brass screws; gas, however, will corrode brass. All screws should be well greased with Russian tallow.

All conveyances where right angles are required should be knuckled round, instead of the joints being mitred at an angle of 90 degrees; it is surprising how much a right angle in a conveyance takes off the flush of wind; crooked conveyances should not be too small.

THE SLIDES OR SLIDERS.

The office of the slide or slider is to cover and uncover the holes in the table of the wind-chest or sound-board. When the stop is drawn the holes in the slide correspond to the holes in the table and the upper board, and the wind is free to pass from the channels to the pipes: when it is closed the passage of wind is stopped by the plain part of the slide.

Some builders make the slides to work on leather, which is a very good plan. The slides require to be accurately fitted; the best way to test this is to fill the bellows with wind, having no stops drawn, lay an arm on the keys, and notice by the tell-tale how much or how little of the wind runs away, and

if any of the pipes speak. One reason why the treble end of stops get out of tune in the summer is, that ill-fitting slides shrink sufficiently to rob the pipes of their wind—yet, if the slides are too tight they will draw hard, or perhaps not at all, in damp weather. The holes in the table, slide and upper board, which, when the slide is drawn, convey the wind from the channel above the pallet to the pipes, should be of a slightly tapering form, the enlargement being towards the lower or channel end; each hole should be open perfectly clear and true when the slide is drawn, and also perfectly closed when the slide is reversed. Three-quarters of an inch is a fair shift for a slide; some shift only five-eighths of an inch, but this is frequently insufficient and unsafe, the wind finding its way through in consequence of the hole or mortise in the table and upper board being scarcely covered by the slide.

The holes of a slide have to be arranged to suit the channels, and if possible to accommodate the position of the pipes; they must also be sufficiently far apart lengthwise to allow the shift of the slide to cover and uncover perfectly. This is generally managed by placing the succeeding pipes of a stop diagonally, and at the top treble diagonally in ranks of three, as, otherwise, the closeness of the treble holes would not leave so much clearing room for the shift of the slide, which is also more fully occupied in its width by diagonal treatment.

THE PALLETS,

or valves in the wind-chest, would be better if they were well felted as well as leathered, and the springs should not be too strong, just a little margin over the strength necessary to make the key rise promptly; so as to secure lightness of touch, and to prevent clattering of the pallet when it closes. To prevent the pallets being jerked below their guide pins a thin spline of wood edged with leather, and called a thumping-rail, is sprung into position (about an inch below the pallets) and is easily removed when required, by bending it outwards sufficiently to clear one of the mortises into which the ends fit.

When a wind-chest contains more than six stops, it is better for the pallets to be near the middle of the length of the channel, rather than at one end, to allow the wind quickly to reach both ends.

The suction of the pallets when the wind-chest is full of wind may be in some measure remedied by what are known as split pallets, the lower and smaller part of which opens slightly in advance of the bulk of the pallet, and admits sufficient wind to counteract the suction caused by the pressure of wind being all on the wind-chest side of the pallet. Divided, or cut pallets, one end of which opens in advance of the other, answer the same purpose. All things considered, the desirability of using them, except for the bass notes, is questionable.

Pallets are sometimes guided by a single pin, the pallet ends being slotted, and pedal pallets by a pin in the end of the pallet working in a parallel staple. The pallet springs should be sighted for accuracy before being inserted, as slight but obstinate cases of ciphering may result from a little error in the accuracy of the spring and its hooked ends.

Pallets opening upwards, away from the pressure of wind in the wind-chest, that is, the position of the pallets exactly reversed, would, of course, *do away with all suction*, and would also admit the wind more freely to the channels ; and the weight of the touch would be only the *difference* between the pressure of wind in the wind-chest and the strength of the spring ; whereas now the weight of the touch is the *sum* of the pressure of wind in the wind-chest and the strength of the pallet spring—and the suction, when several large stops are drawn, is considerable. If such pallets would work without ciphering, moderately large organs could be played with that which is the best of all actions—a good bushed metal square and tracker movement.

The holes in the metal slip beneath the wind-chest should be set out very carefully, or the pull-down wires will cut or saw the metal away until they find correct positions, thus allowing wind to escape. The pull-down wires should fit the holes as closely as possible to work freely.

Bourdon pallets may sometimes be seen, which, instead of being hinged, are removable, simply working on a pin, like a key, but these are liable to hang if the pin holes are not large enough for free movement; they can, however, be eased for this fault. It is a great advantage to be able to remove them so easily, and, for hot climates, manual pallets are preferable so fitted.

Some pedal pallets are made rather smaller than the openings, the leather with which the pallets are covered making up the deficiencies and filling up the orifice. These answer well for pedal work, as they do away with a lot of suction of the pallet, but they will not do for manuals on account of possible slight leakage.

THE ORDER OF SUCCESSION OF THE PIPES

upon the sound-board is of various kinds. Chromatic succession, in which the lowest note is at the bass end of the sound-board, proceeding semitonally towards the highest note of the treble at the treble end avoids rolling off in the action, but a drawback arises from the greater part of the weight of the pipes falling on the bass end of the wind-chest and the building frame, which, however, can be strengthened to bear the unequal weight. Another

objection is that large stopped pipes, if placed in chromatic succession, are said to injure the quality of tone of each other. There is also the unequal demand on the wind in the wind-chest.

The usual order of succession is to place each alternate note of the lowest octave or more at the treble end of the sound-board, the remainder of the pipes following each other in chromatic order; this plan distributes the weight sufficiently, does away with the objection to large stopped pipes standing in chromatic order, and the unequal demand on the wind; and simply involves rolling off the few bass notes which stand at the treble end.

Another method is to have the lowest note in the centre of the sound-board, and each alternate note towards the treble and bass ends. This involves rolling off every note in the action except the one which happens to come immediately in line with the key or part of the action to which it belongs; the weight, however, is in the centre of the wind-chest, which is not altogether desirable: but this arrangement is an excellent one for facility in tuning, especially for the swell organ, as, if the ends of the swell-box are provided with swell shutters the notes are easy of access, and the sound spreads well. If swell shutters are not used at the ends, it is best to have folding doors for the use of the tuner. Probably the very best order of succession is that

in which the two largest pipes stand one at each end, and the remainder in succession alternately towards the centre of the sound-board, which should be long enough to admit of standing room between the two highest notes; or the wind chest should be in two parts, with a passage board between them. It is usual to commence with the 8ft. C at the bass end, which is called the C side of the instrument, the treble end being called the C# side.

ACTIONS.

Backfall or lever actions are commonly used. They should be well made and properly centred, with the centre pins at right angles to the lever or backfall; not, as is often done, with a straight piece of wire as a common centre to several splayed backfalls. If backfalls are long they spring in their length, and shy on one side, and if improperly centred they roll as well, giving an unpleasant, uncertain, springing touch. Another fault is that a backfall action is a pushing action. As before stated, the best of all is a bushed metal square and tracker action, which, being a pulling movement, gives a pleasant touch and prompt response. The reason these are not more generally used is that the backfall action lends itself more readily to the ordinary position of the great organ, and to coupling movements.

Pneumatic lever actions work on the principle of inflation of a feeder, or motor, by heavy pressure wind when the key is depressed, but the pressure of wind or the size of the motor must be so adjusted as to be of sufficient power to draw the action attached to that portion of the motor which is free to move when the inflation takes place: when the key rises the wind is cut off, the motor empties by means of an exhaust valve, and collapses, allowing the pallet to close by means of its spring.

This action is very useful for large instruments in which the suction of the large pallets, weight of couplers, long action, and other complications, make the touch too heavy to be comfortably overcome by the finger in playing; but unless excellently made it lacks exact precision of attack, and loses a deal of delicate touch and phrasing, and there is no sharp edge to the cessation of tone.

In the tubular pneumatic system the motors are inside the wind chest, and the pressure of wind (when the key is at rest) has access also to the interior of the motor, so that the top of the motor is balanced by the pressure of wind within and without.

When the key is depressed a double valve closes an exhaust, and admits wind from a wind-chest close by into a tube which is led to a board close to the organ wind-chest: in this board is a circular

hole covered by a slack leathern disc called a puff, which is inflated or lifted by the pressure of wind; upon this puff rests a turned wooden disc adjusted to a double valve which cuts off the wind having access to the interior of the motor, and at the same time opens an exhaust to allow this wind or air within the motor to escape; the consequence is that the pressure of wind upon the top of the motor (the balance being destroyed) causes it to depress or collapse, and open the pallet attached to it.

When the key is released the conditions are reversed, and the balance of wind being restored, the motor rises by the aid of a light spring, and closes the pallet. Provision must be made to exhaust the wind or air in the tube when the key is released, or the pallet will not close promptly.

Tubular pneumatics give a very plump tone in pedal work, as the pallets may open and close in parallel motion instead of being hinged. The area of surface of the motor must well exceed that of the pallet it actuates, in order to overcome the latter and the strength of the spring, unless independent heavy pressure wind is used, but the ordinary pressure will act if space can be spared. This requirement also ensures plenty of speaking room for the pipes.

Circular pallets and motors are used for pedal work. The difficulty of prompt exhaust, added to

the variation in the lengths of the tubing, (which may reach a hundred feet or more,) tend to a loss of precision, but great strides have recently been made in improvements.

Tubular pneumatics if well made do not easily get out of order after careful adjustment, and the system lends itself easily to octave work, but the weight and cost of the tubing is a serious item.

Electro-pneumatic actions,—a combination of electrics and pneumatics—are lately coming to the front, and these without doubt fulfil all requirements, except perhaps reliability, and that great difficulty is now claimed to have been overcome. In the hands of an able electrician, no doubt such an action can be made to work well, but in ordinary hands electricity is possibly too subtle an agent to employ.

The electricity opens a tiny disc valve, admitting the heavy pressure wind to the pneumatic movement near the pallet.

The noise from a mechanical action results when the key *rises*, and not so much when it falls: this is worth consideration as it will be found that the greater portion of the noise may be eliminated by careful playing, if attention is given to the manner in which the fingers leave the keys. All movements should be well bushed, clothed, and felted.

Some players use the organ as if it were an instrument of *percussion*, instead of one of *concussion*.

The organ demands most careful study, especially in legato and phrasing, the organ proper being an expressionless instrument so far as dynamic touch is concerned.

THE COMPASS

of each manual is usually from CC to G or A. It is better extended to C as is sometimes done, completing the five octaves: especially is this desirable if the compass of thirty notes (CCC to F) for the pedal organ is to be insisted upon. The Council of the Royal College of Organists recommend the C under C position for the pedal board, but to do this with the manual compass of $4\frac{1}{2}$ octaves involves crowding the treble end of the pedal board up against the case, and sometimes the case has to be actually cut away.

If the top F of the pedal board was done away with, the space so gained, (being the thickness of one pedal and the wide space between the E and F,) would bring the pedal board in a fairly central position, giving C under C, or nearly so.

The pedal board is sometimes placed in the centre, but then C is not under C, but towards the bass end, under the A or B $\flat$ of the manuals. For comfort in playing, this is preferable to crowding the top F into the case, if this note has to be used. The C under C position for the pedals with a

manual compass of only $4\frac{1}{2}$ octaves, does not lend itself well to playing a high vocal bass.

Strictly speaking, all manual stops should be of full compass, but it is a common practice to cut some of them short at Tenor C and groove them into the basses of other stops—sometimes of a totally different character of tone, as in the Keraulophon and Stopped Diapason. This practice is much to be regretted, and it is a much better plan to carry them down to Gamut G or the F below, so as to avoid the break in the quality of tone occurring within the range of the ordinary vocal compass, or in the playing over of hymn tunes and chants, etc.

THE KEYS

of the manuals should be of good pattern, with sharps of ordinary shape, but the fronts of the overhanging manuals are sometimes too fleet to admit of a fairly deep touch, which, in a mechanical action, is sometimes unavoidable; in such a case the under side of the key adjacent to the one depressed is apt to uncomfortably catch the fingers when the key is being released.

All keys should be well bushed, (as indeed should every movement throughout the organ,) and fitted with bat, or oval pins, which can be turned partly round after the holes in the keys have become worn.

The keys are prevented from rebounding upwards by a strip of wood felted on the under side and weighted with lead, called a thumper, which rests on the top of the keys, and *should* rest equally on every key: the thumper will be found behind the long strip of wood just above the keys.

THE DRAW STOPS

should be arranged in position so as to be easy of access, and in proper order as regards the pitch of the several flue stops,—the deepest toned stops being below—rising as the pitch of the respective stops rise; and above the highest stop of the flue-work the reed stops should follow in the same order.

Diagonal draw stops are very convenient, but as they are fore-shortened in consequence of directly facing the performer, it is not always easy to discern at a glance whether they are drawn or closed. The same, or nearly the same, may be said of sloping draw stop jambs.

THE DESK

is a most important item, and should be as large as possible, quite flat, at a proper angle of inclination, with the ledge slightly inclined inwards rather than at a right angle to the desk. Some desks are fitted with patent desk hooks, which give way and recover themselves when the leaf is turned over.

THE PEDALS

are recommended by the Royal College of Organists to be straight and concave, with the fronts of the sharps forming an arc of a circle of large radius; but some prefer a *slight* radiation of the entire pedal board.

Occasionally the pedals are fixed too low down for the heels comfortably to reach the naturals: yet great care must be taken that they are not fixed too high or the knees will knock against the under side of the board on which the key-boards rest, or the doors slide upon, which board has sometimes to be cut away, or made to fall back with joints and button back, to give room. The same may be said with regard to the position of the swell pedal.

COMPOSITION PEDALS

should be of the kind known as double-acting and self-recovering,—that is, they push in and draw out at the same time such stops as are required to form the combination set upon the pedals by the builder, and when the pedal iron is released it recovers itself by means of a spring to its normal position, which should be well clear of the pedal board: there is then no necessity to place the pedal irons in the wide spaces between the sharps of the pedal board. All composition pedals should follow in crescendo order from *p* to *ff*.

[The writer once saw at an Exhibition at Kensington, a composition pedal which threw out any combination desired by the performer, who simply had to turn partly round such draw-stop knobs as he wished the pedal to throw out, when it would act upon those stops and no others. He believes the organ was by Jones, late of Brompton Road.]

FROM KEY TO PALLET.

By depressing one end of a key the other end rises. In this end is inserted a sticker or upright rod, the wire at the top end of which is in one end of a backfall or lever; the other end of this lever falls and pulls the pallet open by means of the pull-down wire which passes through a metal plate in the under side of the wind-chest. The pallet which is faced with leather and has a spring, covers the orifice admitting the wind to the channel of the corresponding note. Rolling off has frequently to be resorted to, and consists of leading the movement sideways by means of a small iron tubular roller, having two projecting arms with a hole in each to carry the stickers or trackers. The roller turns or rolls on pins passing through two studs fixed upon the roller-board.

In a square and tracker action the movement is simply led from the key to the pallet by stickers, squares, trackers, and rollers. The longest roller

is usually the lower C#, and if of great length it should be prevented from drooping by being passed through additional studs, or made into two lengths connected with each other by what is known as a bridge. All long horizontal trackers should be round in section, and be supported at frequent intervals by passing through bushed registers or guides.

FROM BELLOWS TO PIPE.

When the handle of the bellows is operated, the feeder descends; the valves upon the board at the bottom give way, and the feeder fills with air: when it rises, the confined air cannot escape through the valves by which it entered, but is forced through similar valves upon the middle board of the bellows into the reservoir, or that part of the bellows which inflates and collapses, and it is in like manner prevented from returning into the feeder by reason of the valves closing and shutting it in; this wind, having a pressure given to it by the weights upon the bellows, is free to rush up the wind-trunks into the wind-chests: if the pallet is open it rushes along the channel above, but cannot pass through to any pipes until one of the slides above the channel is drawn, or shifted about three-quarters of an inch, (as the slide covers the holes leading to the pipes until the stop is drawn,) when the holes in the slides

correspond to the holes in the table and those of the upper board; the wind is then free to reach the pipe belonging to the stop drawn and the pallet which is open. Pipes which stand over their respective holes are said to stand over their wind, but it is very usual, and sometimes may be necessary, to place pipes in another position; in that case the wind is conveyed from the proper hole to the pipe by a groove in the woodwork, or a metal tube called a conveyance; pipes so treated are weak unless they are remedied in voicing, and slow of speech; such pipes are said to be grooved or conveyanced off.

COUPLER ACTION

usually consists of a set of backfalls set in a beam which rises or falls bodily into action when the coupler is drawn, by the action of wheels and wedges, or otherwise.

When the backfalls are lifted, the wheels should rest on a level surface of the wedge block, or the stop will run in of itself through the weight of the backfalls and beam forcing the wheels down the incline of the wedge. In old organs, before the wheel and wedge system was used, the draw stop had sometimes to be hooked down to prevent it running in of itself.

It is necessary, as a rule, that both ends of a set of coupler backfalls should, by means of a stout iron

roller, lift and fall equally and simultaneously; but the beam of manual to pedal backfalls is sometimes made to fall at one end only, on the principle that plenty of clearing room is given, and that it is right in position when the coupler is drawn. In some organs the backfalls are lifted by a sling at each end.

The old-fashioned tumbler coupler consisted of a beam of about one-and-a-half inches square, through which the proper number of short stickers moved freely in mortises. When the draw stop was in, the stickers were in a horizontal position, and vertical (the beam tumbling over) when the stop was drawn. As it came into position the stickers refused to move through the mortise of any note that happened to be held down when the stop was drawn; the consequence was that if it was drawn whilst playing, it momentarily lifted the keys and fingers. It is now obsolete, being faulty in other respects.

Some couplers act by shifting one end of a set of stickers under wedging blocks attached to the under side of the keys.

A drum coupler (Swell to Great) consists of a set of wooden lozenges (hinged on a wire in a beam) which slide in and out of position under or between wedge blocks attached to the keys, filling up the space between when drawn; these couplers are very reliable, and may be regulated by opening or

closing a saw-cut in the key by means of a tapped wire having a loop to turn it by. Frequently two wedge blocks are used, but one (attached to the upper key) is quite sufficient, and in fact better, as the lozenges do not have to climb the incline as when two blocks are used—the coupler also drawing easier.

Beware of manual couplers (Swell to Great) which are supposed to act by pressing a button directly upon the top of the key. Necessarily the action is much too close to the centre or balance of the key, involving a short, hard, and sometimes false action, extremely sensitive to regulation, and liable to derangement by the movement of the backfall beam. They are frequently unreliable, and it is certainly unsafe to play other couplers through their agency, as, for instance, a swell Sub-octave acting upon its own manual.

For convenience of manipulation, the Great to Pedal coupler is best provided with two draw stops, one on each side; or a reversing pedal.

Sub and Super-octave couplers, and sometimes Swell to Great couplers, are made to act directly upon the pull-down or tracker wires. In such a case the keys of the notes so coupled do not fall unless they overbalance, but the coupling is just as effective; although some like to see the keys fall, especially in a Swell to Great coupler.

Manual to Pedal couplers are led by rollers from the pedal scale to a straight set of rising and falling backfalls set out to the scale of the keys. Some builders simply splay the backfalls from the pedal scale to the key scale, but at the treble end the splay is too much, and the backfalls either chafe each other or have to be very thin.

SUB & SUPER-OCTAVE COUPLERS.

A Sub-octave Coupler is one which connects or couples the octave below the key depressed, either upon the same manual or upon another. The lowest septave of the manual to which the notes are coupled does not act unless the extra twelve notes below are added to the compass upon the sound-board of the coupled manual. This is not required in a Sub-octave coupler, but the corresponding twelve notes above are desirable in the case of its companion coupler—the Super-octave coupler—which as its name somewhat erroneously implies, couples the octave above. Its proper name is Octave, the prefix (Super) being used simply to denote direction.

One disadvantage of Sub and Super-octave couplers is, that as a rule the backfalls of the movement are always in action when the organ is used, whether the stop is drawn or not. This is a very noisy arrangement, especially if both couplers act upon the same manual.

DRAW STOP AND COMPOSITION PEDAL ACTION.

In old organs the slides are actuated from the draw-stop by means of an upright roller. The slides are now usually drawn by means of levers, something like huge backfalls, which are operated either by squares, or by upright iron rollers or trundles having three arms—one each for the lever rod, the draw-stop, and the composition pedal if it is required; felted blocks being screwed upon some of the rods leading from the arms (to a bushed register in the third instance) to enable the tumbler or fan moved by the composition pedal to form the combination set. The combination can be easily altered, if required, by taking off or putting on blocks. In old organs the composition pedals acted by means of horizontal iron rollers shifting the slides; and usually they were only of single action, either drawing or closing the slides operated upon; they therefore had the disadvantage of not leaving out the proper combination if double-action was required to form it.

THE SWELL PEDAL

is now frequently balanced, but one objection is, that in consequence of having no spring or weight

the swell shutters do not close tightly, but simply rest at the first point of contact. The Council of the Royal College of Organists recommend the swinging rod and notch arrangement, which closes well.

The swell pedal should not have its motion or action transferred to the shutters without taking some means to so regulate the movement as to make the shutters open *faster* as the pedal descends. This is rendered necessary on account of the fact that the effect gained by opening the shutters decreases rapidly in proportion as the shutters open. This requirement at first sight appears to set a somewhat complicated problem, but it is very easily solved by means of what is known as the "cow-heel" movement, which is a kind of crank, or eccentric, which lifts very slowly at starting, gradually lifting faster as the crank sweeps round and upwards; care must be taken to set it a little on the start when the shutters are closed, or it is apt to fall back to the dead centre, and refuse to move till attended to. Swell pedals often describe an arc of too short a radius to be comfortable in using. Swell shutters should open wider than they sometimes do, nearly to right angles, and on at least three sides of the swell box. Vertical shutters are best for balanced swells. Inverted swell shutters, *i.e.*, opening downwards, and

shutters on the top of the swell box, although they throw the sound upwards, are very undesirable, as if left open they shoot any dirt which may have fallen upon them into the organ. Very wide shutters are apt to warp, and also to affect the tuning by shading some of the pipes when the swell is opened, and it is a lesser evil to have one or two more edges of shutters obstructing the sound.

The following is a method schemed by the writer for altering the ordinary swinging rod swell pedal so as to be able to set the swell open at four or five different degrees of power, and yet use it in the ordinary way—a kind of ratchet swell pedal.

Take out the swinging rod after marking upon it the height of the upper surface of the swell pedal, both when the swell is fully closed and fully open, and between these two marks cut on its edge notches about an inch apart. (See Fig.) Prepare a piece of hard wood about three-eighths of an inch in thickness, a quarter of an inch wider than the swinging rod, and of sufficient length to reach from the bottom of the swinging rod to well above the part which rests against the foot when the swell is closed—say six inches above the top notch.



Screw this piece, so prepared, to the back of the swinging rod, taking care to keep the plain edge, which the boot touches, beyond the teeth of the notches, so as to prevent the edge of the sole of the boot from being caught when the pedal rises. Take out the swell-pedal iron, and after widening the mortise to take the double thickness, lengthen it at the end where the plain piece on the swinging rod projects beyond the notches; not right across the width of the mortise, but only sufficiently wide from the back to allow room for the piece screwed on the back of the swinging rod to work freely in a continuation slot of its own (See Fig.); the notched piece



will then, when required, catch on that portion of the pedal-iron where the mortise has not been lengthened. Care must be taken to well under-cut the end of the mortise against which the notches work, and also for the sweep of the pedal in descending.

The mortise or slot should not be more than about two inches from the near end of the pedal. A very slight inclination of the swinging rod is sufficient, owing to the additional weight at its lower end, which makes it very certain in its action. Too much inclination will cause it to click,

although this only happens when it is desired to set the swell open. It is best for the notches to be cut in the actual swinging rod, and not in the piece screwed on, as, in the latter case, the strain would fall upon the screws. If it is desired to render it extra safe from catching in ordinary use, the piece screwed on may project further. The position should be such that in the ordinary placing of the foot upon the pedal the ratchet rides clear.

The relative position of each department—keys, pedals, draw stops, composition pedals, swell pedal, etc., should be such that all can be easily reached without shifting the position on the seat.

PNEUMATIC THUMB PISTONS

fitted in the key slip are excellent for forming combinations, and it is surprising how well and quietly they work. They are really pneumatic levers or motors on a large scale.

VENTILS

or valves, by which the wind is let on or cut off certain wind-chests, have the disadvantage of affecting the whole group of stops belonging to the wind-chest bodily, and also fail to show by the draw stops whether the wind is on or off: this, however, could be remedied by mechanical means,

but there is also the disadvantage of the selection of the stops having been grouped to suit the pressure of wind maintained in the wind-chest.

A CONCUSSION BELLOWS

is a feeder attached to the under side of the wind-chest, or to the wind-trunk, and open to the same; and if any unsteadiness arises by reason of bad blowing, or sudden demand or cessation of demand on the wind, the feeder inflates or collapses, and, being controlled by a spring, takes or gives pressure as required.

THE PIPES.

The large wood pipes should be made of pine, clear-sized and varnished: metal pipes should contain a large proportion of *tin*. Zinc pipes, having pipe metal lips, are good for bass notes, and have the advantage of being light, but no acid should be employed in soldering, or the zinc will in time corrode. Nor should they be lapped at the joint—or baked. Good spotted metal with large spots is best, and it should be of good thickness—and pure tin for such stops as Gambas. Lead is not a good musical substance; it is too soft, and sometimes the feet of large pipes crush up with the weight. It is said that spots can be produced in inferior metal by

using antimony. The spots should not be very small; such is known as "pepper and salt" metal.

PRESSURE OF WIND.

In a large organ several different pressures of wind are required; from two or two-and-a-half inches for soft flue stops, to eighteen or twenty inches for the Tuba. Reed stops require a comparatively heavy pressure to obtain the best results, but most moderate-sized organs have only one pressure—from three to four inches.

The pressures of wind used for the organ in St. Paul's Cathedral are

GREAT ORGAN.

Small Open Diap., etc.	..	3½ in. wind.
Large Open Diap., etc.	..	5 "
Reeds (16ft., 8ft., 4ft.)	..	6 "

SWELL ORGAN.

Flue work with Hautboy	..	3½ "
Reeds (16ft., 8ft., 4ft.)	..	6 "

CHOIR ORGAN.

Flue work	..	2½ "
Reeds (Clarinet and Cor Anglais)		3½ "

SOLO ORGAN.

Flute Harm., 8ft., and Con.		
Flute, 4ft.	..	4 "
Corno-di-Bassetto and Orch. Oboe		3½ "
Tuba Major, 8ft., and Tuba		
Clarion, 4ft.		17½ in. Treble, 14 in. Bass.

PEDAL ORGAN.

1.	Double Open Diapason	32 feet	3½ inches.
2.	Open Diapason	.. 16 ..	7 ..
3.	Violone	 16 ..	2½ ..
4.	Octave	 8 ..	7 ..
5.	Violoncello	 8 ..	7 ..
6.	Mixture	 3 rks.	7 ..
7.	Contra Posaune	.. 32 feet	3½ ..
8.	Grand Bombarde	.. 16 ..	18 ..
9.	Clarion	 8 ..	18 ..

The pressure on the Tubas by Willis at the Albert Hall, London, and the organ built for the Alexandra Palace, is something like 22 inches.

The Westminster Abbey organ, by Hill & Son, has 3½-in. and 5-in. on the Great organ small and large Open Diapasons; 5-in. on Pedal reeds; 3½-in. on the Swell stops; and 11-in. on the Tuba.

The organ at the Temple Church has only two pressures; 3¼-in. wind on all except Solo organ and pneumatics, which have 5 inches.

In the organ by Lewis at Newcastle Cathedral the pressure varies from 3¼-in. to 13½-in.

In the organ by Walker, at Christ Church, Lancaster Gate, there is a flue stop on 13-in. wind, sounding something like a very fine Flute Harmonique.

A wind gauge, or anemometer, is a tube of glass bent so as to hold water in one of the bends; one

end of the tube is fitted with a pipe foot, which is placed in one of the pipe holes, and the amount of displacement of the water by the wind denotes the pressure.

PEDAL WIND-CHESTS.

Large pedal stops do not have slides, but a separate wind-chest, and the draw stop opens a diagonal valve or pallet (placed in the pedal wind-trunk) which admits and cuts off the wind to the wind-chest. In superior organs, the draw stops of the largest pedal work also at the same time connect and disconnect the pedal action belonging to the stops by lifting and falling backfalls, so that when the stop is not in use, although the pedals may be, the large and somewhat noisy pallets are not continually clattering as they would be if the action was always running with the wind simply cut off.

THE SEVERAL ORGANS.

Each organ, especially those of the Great, Swell, Choir, and Pedal, should be fairly well balanced in tone independently of each other, as well as in combination.

The order of claviers, and the departments of a large organ are—

Echo Organ,
Solo Organ,

Swell Organ,
Great Organ,
Choir Organ,
Pedal Organ.

THE GREAT ORGAN,

as its name implies, contains pipes of large scale and powerful tone. Strictly speaking, soft stops have no place in the Great Organ unless the manual has to do duty as a Choir as well as Great. Such a system, although very general, is not very desirable, but one soft accompanying stop is very useful in three-manual instruments, to enable the performer to make use of the Swell and Choir coupled, for a solo.

THE SWELL ORGAN

is that portion contained in the swell box. The pipes are of smaller scale than those of the Great Organ, and it is usual to include some soft and fancy stops, also a good proportion of reed stops.

THE CHOIR ORGAN

is intended to be used for soft accompaniment to the voices, and should consist chiefly of soft, mellow, flute-toned stops; and one or two reed stops; all are best enclosed in a swell box, which should open fully on all four sides.

THE SOLO ORGAN

consists chiefly of stops of an orchestral quality of tone, some of which may be enclosed in a swell.

THE ECHO ORGAN

is an organ of stops of small scale and of delicate and very soft tone, and may be included in the swell box of the swell organ although possessing a separate manual; if this is done, and indeed in any case, the shutters and box should be not less than three inches in thickness and well fitted.

THE PEDAL ORGAN

belongs exclusively to the pedal board, and should consist of ranks of pipes in continuation, as it were, of the tone of the stops upon the manuals, but of more powerful tone, and it should be possible to find on the pedal organ a suitable bass, or a contrast, to any stop upon the manuals.

MANUAL FLUE STOPS.

The metal OPEN DIAPASON, 8ft., may be termed the ground-work of the organ. The CC pipe approaches 8ft. in its length, and its scale is usually about six inches. The lower portion of this stop is generally made use of to form the front. When so

used, some of the pipes are made longer than their speaking length for the sake of appearance, and portions of the back of the pipe are cut away down to the length required to give the note desired, and a portion of the metal at the top or sides of the speaking length is so cut as to form a tongue or tongues for tuning purposes. By pressing the tongue of metal towards the pipe it is flattened, and by opening it outwards it is sharpened. The tuning of the smaller pipes is effected by coning the tops of the pipes (by means of tuning cones) inwards to flatten, and outwards to sharpen them, or by a shifting metal clip or cylinder at the top of the pipe, by tapping which upward flattens, or downward sharpens. (Lengthening a pipe flattens it—shortening a pipe sharpens it.) The tone should be full and powerful, but is sometimes windy and empty.

The VIOLIN DIAPASON, 8ft., HORN DIAPASON, 8ft., SALICIONAL, 8ft., DULCIANA, 8ft., PRINCIPAL, 4ft., TWELFTH, $2\frac{2}{3}$ ft., FIFTEENTH, 2ft., and kindred stops, are all more or less open diapasons of varying scale and make.

The STOPPED DIAPASON is of wood or metal, and although the pitch is of 8ft. tone, the pipe is of only half its speaking length, the octave below being produced by the pipe having a stopper or plug in the upper end, which doubles the length of its vibrations; sometimes the stoppers have holes bored through

them to produce a reedy quality of tone. The tone of Stopped Diapasons is soft, full, and smooth, and blends charmingly with almost any other quality of tone, and especially with tone of an opposite quality, such as a Gamba. It has been called "the bread of the organ." It is tuned by shifting the stoppers upwards to flatten and downwards to sharpen. LIEBLICH GEDACTS, CLARINET FLUTES, ROHR FLUTES, &c., are Stopped Diapasons.

The CLARABELLA, 8ft., is an open wood stop of full, flute-like quality of tone, and is tuned by means of metal shades at the tops of the pipes. Occasionally the mouths of the pipes are inverted, the splay of the lip being inside the pipe. They are made in many varieties. The compass of the open pipes seldom extends lower than middle C, below which the pipes are of half length, and are stopped at the top—(Stopped Diapason).

The GAMBA, 8ft., of metal, or still better, of pure tin,—especially the kind known as the bearded Gamba, having a bar or roller in front of its mouth to augment the amplitude of the vibrations,—is of delicious stringy tone, combining and contrasting well with other stops. Sometimes they are provided with bell tops, but usually a slot is formed in the pipe near the top, and the metal from the slot is rolled up and made use of to tune by. Common Gambas are generally slow of speech, but bearded Gambas speak

very quickly in comparison. These, and many other open metal pipes, are sometimes tuned by means of a metal clip or cylinder, as before mentioned.

The KERAULOPHON, 8ft., is virtually a small Gamba; it is inclined to be slow in speaking, as indeed are all pipes of small scale unless they are well voiced, owing to the disproportion between the length and the scale.

The DULCIANA, 8ft., is really an Open Diapason of very small scale. Like the small Gamba, it is apt to speak slowly, and for the same reason. The tone is very delicate. This stop and the Gamba should sometimes be of 4ft. pitch, to complete the family tone.

The HARMONIC FLUTE, metal, generally of 4ft. pitch, is, as its name implies, a Flute, or species of open flue-work. Its pipes are of double their speaking length, and have a small hole midway, which helps the pipe to sound, or fly off, into the octave above. The tone is fluty, brilliant, and penetrating.

The HARMONIC PICCOLO is of the same nature as the Harmonic Flute, and the corresponding stop in 2ft. pitch, but a little more subdued in tone. The Bass of Harmonic stops is carried down by means of pipes of ordinary length voiced to match the tone, and by stopped pipes.

The VOIX CELESTE, and Vox ANGELICA, consist of two ranks of pipes of small scale; one rank of

which is tuned slightly sharper or flatter than the pitch of the organ, (the Voix Celeste being tuned sharper, and the Vox Angelica flatter,) producing a pleasant waving effect: the waving, however, should not be too pronounced.

MUTATION STOPS, (virtually Open Diapasons of small scale,) are those of the MIXTURE or SESQUI-ALTERA kind, which speak pure harmonic intervals above the ground tone, such as the fifth, octave, twelfth, fifteenth, nineteenth, twenty-second, &c., or their duplications, and are supposed to *represent* the natural harmonics or overtones which result from almost all musical tones (see Quality of Tone).

Mixtures therefore should only be heard when they bear such a proportion of power to the prime tone as to follow out such representation.

These natural harmonics form the *locus standi* for Mixture stops, and the only Mixtures which, even in a large organ, will bear using, are those by builders who attain an approximation to the natural harmonics, both as to intervals and their proper relative proportions to each other as regards power. The ordinary Sesquialtera, or three-rank Mixture is much too loud, and disproportionate, and sometimes the intervals selected might have been improved upon.

Mixtures, unless they are very softly voiced, and properly balanced in power, are undesirable, for

generally they make more noise than music. Their harmonic relationship is in their favour, but it is difficult to reconcile their intervals with those of equal temperament, to which they are antagonistic. In modern instruments the string-toned stops and reeds present the upper partial tones or harmonics in their most agreeable form, in addition to which equal temperament gives some edge or keenness to harmony, without the aid of Mixtures.

Various names are used for Mixture work, according to its composition, (which varies,) as Mixture, Sesquialtera, Cornet, Cymbale, Fourniture, Sharp Mixture, Full Mixture, Dulciana Mixture, Tierce, Larigot, &c.

In consequence of the smallness of the pipes, "breaks" in the pitch have to be made at intervals in the compass. (See "Break"—Vocabulary.)

REED STOPS

are of two kinds,—the Striking Reed and the Free Reed. In the Striking Reed, the vibrator, or tongue of metal, strikes against the reed, or metal tube inserted in the block of metal fitting into the boot of the pipe, setting up vibrations in the body of the pipe. Some of the larger pipes are occasionally only of half the speaking length. The smaller pipes of reed stops are usually open diapasons voiced to match the tone.

Harmonics can be obtained from Striking Reed stops upon any pressure above 10 inches.

Striking reeds are of two species—open and closed: *i.e.* the face of the reed is open throughout its length, or one end is closed.

The Free Reed, in vibrating, passes in and out of the orifice freely, without striking or touching. This species is seldom used except in large organs. The writer once made a large wooden reed, and found that the tone was similar to that of a stopped diapason pipe; it is possible, therefore, that very large vibrators would be of service for pedal stops. Small vibrators do not keep sufficiently well in tune for general use.

The quality of the tone of Reeds arises almost solely from the strongly pronounced presence of harmonics, and depends chiefly on the curve given to the tongue, and the scaling and length of the tube of the pipe, which of itself is best, and stands better in tune, when it coincides with the note required, either as unison, octave, or in other harmonic relationship. Reed pipes as well as flues are sometimes made of double, or half, length.

Striking reeds are tuned by means of a wire, (hooked at the top end,) which, forming a spring at the lower end pressing the vibrator close to the reed, may be tapped upwards to flatten, or downwards to sharpen, thus lengthening or shortening the vibrating portion of the tongue.

It is best to tune a reed *by rising* to the pitch, *i.e.* by sharpening: if the pitch is already too sharp, flatten it a little too much, and sharpen to the pitch. By this process they are more likely to stand in tune.

Metal tuning knives for tuning Reed stops are something like a short narrow knife with a long thin handle. Several sizes and lengths are requisite for a large organ: those of light weight are best to obtain a sensitive tap of the tuning wire, and long ones should be hooked at one end so that they can be used in an upright position, which may be more convenient in a large organ having several Reed stops.

In tuning Reed stops, it may be advisable sometimes to very slightly favour the tuning for contingent temperature, leaving them sharp for coming heat, or flat for an expected lower temperature.

The shades at the top of Reed pipes are not for tuning purposes, but for regulation of the power, and consonance of the tube. Some modern Reed stops are provided with caps instead of shades.

If a note refuses to sound, or is "gone off speech," it will sometimes speak by simply tapping the wire upwards, and flattening the pitch to the utmost extent: this allows small grit, which may have prevented the tongue from vibrating, to drop out.

If a note refuses to speak after tapping the wire, it may be necessary to lift the block out of the boot,

and remove the grit by passing a piece of note paper carefully between the tongue and the reed ; or the tongue may have become loose and require to be wedged into position ; but on no account should it be tampered with.

Reeds are always apparently getting out of tune with every change of temperature, but it is really the flue-work which alters most,—heat sharpening the flue-work, and slightly flattening the reeds.

One would naturally think that the expansion of a pipe by heat would tend to flatten it, but such alterations of pitch are attributed by some to changes in the density of the column of air—heat rarefying and cold condensing. This is said to have been proved by driving coal gas through a pipe, when it produces a sharper note ; and to be still more forcibly proved by using the lightest of known gases, hydrogen. But, as an increase of pressure condenses the air and also sharpens the pitch, the subject becomes complicated ; although pressure may be one thing and condensation or rarefaction another.

A Reed sharpens somewhat by cold, owing to the increase in the rate of vibration of the tongue due to its greater rigidity ; and *vice versa*.

Singularly enough, the lengths of the tubes or bodies of reed pipes are generally the reverse of those of flue pipes—the smaller the scale the shorter the tube.

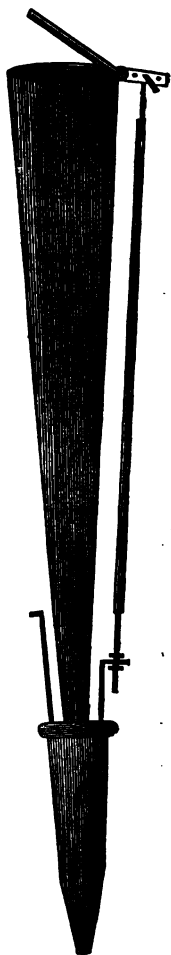
The writer has tried a method of his own to act as a kind of compensation to keep the reed in tune with the flue-work. It is this:—

A flap or shade to cover the top of the pipe is hinged upon the side of the pipe so as to rise and fall, to which is attached a piece of ordinary wooden sticker rod from the projecting arm of the flap down to the bent metal roller arm in the block in the boot. (See Fig.)

The arm of the flap may have three holes drilled through it for the copper wire of the tracker to hook into; and the tapped wire below must pass through a bent metal roller arm, and have two ordinary cloths and buttons for regulation.

The lengthening of the pipe by heat (the wooden rod will remain almost steadfast) tips up the flap and sharpens the pipe. The flap should, if correct for power and consonance, be regulated to stand at an angle of 45° when the temperature is at about 55° or 60° .

The tone of the pipe would probably be a little modified in cold weather, but this arrange-



ment prevents a deal of wear and tear of the spring on the tongue by constant tuning, to say nothing of the saving in time and trouble. The rough one made and fitted kept the note well in tune for months, and was eventually taken off because there was a very slight difference in the quality of tone of the note owing to that pipe only having a shade.

Probably, to give exact compensation, the cow-wheel principle would have to be introduced, but the main idea is only given for what it is worth.

The HORN, 8ft., TRUMPET, 8ft., CORNOPEAN, 8ft., HAUTBOY or OBOE, 8ft., CLARINET, 8ft., CLARION, 4ft., and PEDAL REEDS, 16ft., are all striking reeds of varying scale, make, tone, and power, and these show the skill of the voicer. The tops of the pipes which are exposed to the dust should if possible be knuckled over, as dust is the enemy of Reeds.

PEDAL STOPS.

The Pedal OPEN DIAPASON 16ft. is the groundwork of the Pedal organ, and corresponds to the Open Diapason upon the Great organ. It is usually made of wood, and should be of good scale, not too large, nor of too powerful a tone for accompaniment. Sometimes this stop, or a Bourdon, is the only stop upon the pedals; this should never be, as it is impossible to voice one stop to satisfy all requirements; and the consequent monotony is wearisome.

- The pipes are tuned by means of a shifting slotted wooden shade (secured in position by a screw,) at the back or front of each pipe, near the top, which is also slotted down for the shade to cover or uncover as much of the slot in the top of the pipe as may be required to bring it into tune. Very often the pipes are tuned by roughly cutting down, or by nailing a piece of wood on the top of the pipe; but this is a poor apology for proper provision for tuning.

The VIOLONE 16ft. is a small scale Open Diapason of a Gamba or stringy quality of tone, or a real Gamba.

The BOURDON CCC (16ft. tone) is about eight feet in length, stopped at the top, and is virtually a Stopped Diapason. It is made in many varieties of scaling, voicing and make. Cutting the mouth of the pipe up high to get the utmost out of a small pipe is frequently resorted to, and it often happens that the tone is fifthy—more of the fifth being heard than of the proper note. It is exceedingly difficult to obtain a thoroughly good Bourdon throughout; the tone of the larger pipes spreads out in waves or loops. Standing at the node of the loop one hears scarcely anything of the note, but move to within the broad part of the loop and the note sounds well. Doubtless the tone of the smaller pipes also spreads in loops, but these

are so small as to come within the reach of one ear or the other.

The Bourdon in S. Gregory's organ, Sudbury, was made by an ordinary joiner according to the writer's scaling: CCC 9in. $\times$ $7\frac{1}{2}$ in.; CC 5in. $\times$ 4in.; C $3\frac{3}{4}$ in. $\times$ 3in.; the mouths being cut up to between a third and a half of the internal width of the pipe.

It will be noticed that the smaller pipes are a great deal too large in proportion to the lower notes. This was done because the upper notes of Bourdons are generally very unsatisfactory in comparison with the lower notes. The scaling of pipes is always increased as the notes rise in pitch, or builders would not be able to get equality of power. For instance, theoretically, suppose a CC open pipe to be six inches in diameter, the C above should be three inches in diameter, but this would not do, because a pipe three inches in diameter is only a quarter as large as one of six inches diameter. This is patent at once if one imagines a square pipe 6in. $\times$ 6in. divided into four, which gives four 3in. $\times$ 3in. areas. But there is a drawback in overdoing this increase of scale, as, in Gambas for instance, the false scaling injures or destroys the quality of tone; this is why the lower notes of Gambas, etc., have a so much finer quality of tone than the upper notes, the upper harmonics being more pronounced.

Next in order comes the QUINT, or fifth; about 10 $\frac{3}{4}$ ft. This should be a separate set of pipes sounding the fifth above the 16ft. pitch. The reason for this is that the fifths should be *pure* intervals, and not so loud as the ground tone; sometimes the lower portion of this stop is borrowed from the Open Diapason or Bourdon by using a fifth Coupler or other means, but the fifths cannot be pure because of the equal temperament, although they appear to be very nearly so, as the pulsations are slow at that pitch.

Were it not known that the *rate of pulsation* of an interval (as a fifth) in tuning exactly doubles itself at the distance of the octave above in a similar manner to the *number of vibrations* of a note and its octave above, it would be difficult to understand that two stops differing in pitch an octave (Open Diapason 8ft. and Principal 4ft.,) combine so well in the use of intervals or harmony as they do. The explanation is, that the ratio of two to one is preserved in pulsations as in the case of vibrations of notes an octave apart.

The Quint stop, combined with the 16ft., gives a resultant undertone of 32ft. pitch, and considerably thickens up the Pedal organ tone.

The 8ft. Pedal OPEN FLUTE is merely an Open Diapason, of somewhat smaller scale than the 16ft.

The 8ft. Pedal is often borrowed by a Coupler,

but the extra twelve notes upwards are necessary to make it effective throughout the pedal compass.

The VIOLONCELLO 8ft. is really a Gamba, or may be a small Open Diapason. A bearded Gamba is best, having the bar across the mouth. They may be made of wood.

The Pedal 4ft. work follows the Open Diapason lines; and the Pedal Reeds, TROMBONE 16ft., etc., wood or metal, are striking reeds, following upon a more powerful scale the reeds upon the manuals. Every manual stop should have its companion or suitable Pedal stop, and its contrast.

Large organs have at least one 32ft. stop on the pedals. It may be of wood or metal Open Diapason, or of wood CCCC 16ft. in length stopped similarly to a Bourdon, and giving a 32ft. tone, but as a rule these are not very satisfactory below the lower A. 32ft. Reeds are seldom used except in very large organs.

In the organ by Hill & Son, at Sydney Town Hall, there is a 64ft. Reed, the number of vibrations of the lower C being only eight per second. The effect is something like a kettle drum.

APPROXIMATE PIPE SCALES.

Internal measurements.

Subject to great variation.

Scale—Inches.

CC of Double Diapason (stopped wood) $6\frac{1}{2} \times 5\frac{1}{2}$

CC of Open Diapason (metal) .. 6

	Scale—Inches.
CC of Stopped Bass, Great org. (wood)	$4 \times 3\frac{1}{2}$
Middle C of Clarabella, Great org. (wood)	$2 \times 1\frac{5}{8}$
CC of Dulciana (metal)	$3\frac{1}{4}$
CC of Gamba (metal)	$2\frac{3}{4}$
Tenor C of Keraulophon (metal) ..	$2\frac{1}{8}$
CC of Rohr Flute (stopped wood bass)	3×2
CC of Principal, Great org. (metal)	$3\frac{1}{4}$
Middle C of Harmonic Flute (metal)	$1\frac{3}{8}$
CC of Piccolo (metal)	$1\frac{1}{8}$
CC of Twelfth (metal)	$1\frac{1}{8}$
CC of Fifteenth (metal)	$1\frac{3}{4}$
CC of Horn, at top (metal) ..	5
CC of Trumpet, at top (metal) ..	4
CC of Clarionet, cylindrical (metal)	$1\frac{3}{4}$
CCC of Pedal Open Diapason (wood)	12×11
CCC of Pedal Bourdon (wood) ..	9×8
CCC of Violone (wood) ..	7×5

THE TREMULANT

is a small feeder, having a weighted valve, the weight being upon a spring, and adjustable; it is attached to the wind-trunk, or connected with the supply of wind, and its purpose is to alternately let off a small quantity of wind, which, by disturbing the pressure at every other movement of the valve, causes a peculiar throbbing or pulsating effect. Several varieties are made.

Tremulants are sometimes noisy in action although they need not be, and the pulsations are sometimes too rapid and pronounced: they will not act properly unless some provision is made to stop the action of the concussion bellows for the time being, which should be done by means of the tremulant draw stop or pedal.

THE CASE.

Musically speaking, an organ is better without a case, and on no account should the organ be boxed up in panel work. Insist always upon having the case so made that the sound may get out. All below the wind-chest may be pannelled in, but all such panels should be made to take out easily, and felted to prevent chattering. Frequently the panels are dowelled at the bottom, and made to lock or button at the top, (sometimes the buttons are almost inaccessible)—a better plan is to have the dowels at the top, and simply push the bottom of the panel into position—its weight will keep it there,—and there is no trouble with dirt getting into the dowel holes.

Bourdon pipes may be placed at the sides, so as to answer for a case, and these would be in a good position to be heard. If placed indiscriminately they block the sound, but if the larger pipes are

located near the back, and the smaller ones rake down towards the front, the tone of the larger pipes will be subdued, and that of the smaller be the better heard, and no very great obstruction exist to block in the tone.

It is better to leave an organ without a case for a time than to have one of the miracles of ugliness which occasionally meet the eye. A good case can be added at any time, especially if the front pipes are set out to any reasonable design. If the larger pipes of the front are placed at or near the two ends of the organ they give the impression of the pipes standing near their wind, and the smaller pipes being between leave room for the sound to get out. Especially is this desirable if the front pipes stand in or under an arch—much better than blocking up all the arch with pipes cut to fit. Organ chambers are abominations.

It is scarcely necessary to add that any design for the case should be in keeping with the building, and follow its characteristics to some extent at any rate.

The following are examples of good organ cases.

King's College Chapel organ, Cambridge.

St. Paul's Cathedral „ London.

St. Lawrence Jewry „ London.

Exeter Cathedral „

Chichester Cathedral „ (modern).

Ely Cathedral organ, suspended (modern).

PRODUCTION OF TONE.

The sound of flue pipes is caused by the stream of wind which issues from the windway near its mouth striking the edge of the lip above, causing the air in the body of the pipe to vibrate.

The *quality* of the tone, or *timbre*, is due to the presence or absence of harmonics yielded by the scale or size of the pipe, its material, make, voicing, amount of wind pressure, or other peculiarity.

The *power* of the tone results from the *amplitude* of the vibrations. Amplitude of vibration is produced by large scale, by heavy pressure of wind, by vibrators in Reed stops ; and in pipes of the Bearded Gamba species by preventing the inrush of external air at the mouth of the pipe by a bar, thus allowing the stream of wind issuing from the windway to vibrate more amply ; also in flue stops by the pipe having a high mouth.

The *pitch* of the sound depends upon the rate of vibration, which is chiefly controlled by the length of the pipe—a long pipe having fewer vibrations in a given time than one of shorter length—but pipes of different stops giving the same note are subject to variation in their actual length through being open, stopped, or partly stopped at the top ; also in consequence of differences in scaling ; yielding of harmonics ; pressure of wind ; shading ; and other

conditions. A pipe of small scale requires to be longer than one of large scale. A stopped pipe is only of half the length of an open one. Softening or shading a pipe flattens it; heavier pressure raises the pitch, and produces a more powerful tone, and so on.

Pipes of large scale give a purer and more powerful tone than those of small scale.

Builders sometimes rely too much on their ability to produce a powerful tone from a pipe of small scale. As a rule it is better to have a large pipe softly voiced, than a small pipe loudly voiced.

A loud tone can be produced from a small pipe by giving it a high mouth, but the tone is not always satisfactory.

No two stops in the same organ should be alike either in scale, quality of tone, or power.

QUALITY OF TONE.

Quality of tone in an organ is of the utmost importance, and does not always receive the attention it demands.

Quality and evenness of tone depend greatly upon the skill of the voicer, added to the scaling, make, shape, and material of the pipe;—a slight variation in the different tone-producing parts of the mouth, windway, lips, languid, block, cap, etc.,

will greatly alter the tone. Pipes which hiss at the mouth are generally empty in tone, and can be much improved by a good voicer.

Quality of tone is very difficult to define. The best way to acquire perception of good quality is to test good and indifferent instruments and stops. More can be learned in an hour by this method than can be conveyed in a whole treatise on the subject.

Special quality of tone depends chiefly on the presence or absence of harmonics resulting from the prime note. Pipes which are comparatively free from the upper harmonics are of smooth tone, (a large scale softly blown Stopped Diapason, for instance,) whilst pipes in which the upper harmonics are strongly marked give a stringy or reedy tone, such as the Gamba or Cornopean.

Pipes of large scale are more free from harmonics than those of small scale. In the case of Reeds, if the harmonics are too pronounced, the tone is harsh, and, in consequence of the strongly marked upper harmonics arising from the prime notes, they do not combine well in chords; the clashing of the harmonics with themselves and also with the equal temperament, (which is at variance with them,) causes the chords to sound unpleasant.

In the Clarionet, for instance, we have a Reed stop, with the small scale tube or body of the pipe,

both which conditions tend in a high degree to throw off harmonics: the consequence is, that, as a rule, chords upon the Clarionet are harsh. No stop of foundation pitch should be unpleasant when so used, and even Clarionets are made which can be used in chords, but few will stand the test.

It is said that if a large number of ranks of pipes consisting of a prime note and its various harmonics are arranged each rank upon a separate slide, and in a separate swell, so that they can be properly adjusted separately as to silence and degree of power, it is found that by varying the harmonics and their powers, any quality of tone can be produced.

BALANCE OF TONE.

Balance of tone in an organ is likewise of great importance.

If an organ is approached from a distance, a pedal note is generally heard first: if, similarly, an orchestra or military band is approached, the violins or cornets, corresponding to the treble part of the organ, come within hearing much earlier than is the case with the organ. As a rule, organs are not sufficiently well balanced with regard to the treble and bass for the treble portion to be as well heard as it should be. The balance of tone

with regard to treble and bass should be such that the upper note of the fullest chord is well heard—not too prominent, nor weak,—and each note in the composition of the chord should be equally heard, and the *quality* of tone of each note in the stop as nearly as possible the same.

But there is a danger in overdoing the power of the treble, in which case the upper notes are too “cutting” or screaming.

The balance of tone must also be preserved in the selection and voicing of the several stops of each manual, so that the full power of the manual, and also of the full organs coupled, shall result in a proper balance of tone.

In the manuals, the 8ft. pitch must predominate, and stops of other pitches add only relative proportion to the power. Again, balancing needs to be considered with, and without, the Reed tone, which also of itself must be balanced in tone. These remarks apply similarly to the Pedal Organ, in which the 16ft. pitch must predominate.

It must not be conclusively assumed that a Double Diapason 16ft. and a Principal 4ft. yield an average tone of 8ft.

But, however well the organ may be balanced in itself, it is the province of the organist to see, when he is registering for performance, that he selects the stops with due regard to balance. A judicious

selection of stops marks the performer at once as one who understands the instrument, and the subjects of tone and balance.

Stops of an opposite quality of tone blend well together, and should also be selected for purposes of contrast.

The Diapasons should do the most duty, and fancy stops and Reeds should be sparingly used. Fancy stops and effects soon pall on the ear, and this applies, in a lesser degree, to the Reeds.

Beware of drawing the Swell reeds whilst playing with the Swell open. Choose the opportunity well,—at the beginning of a musical sentence or subject,—so as to secure a proper effect, and see, as a rule, that the Swell is closed, except when a special effect is desired. More art is required for soft playing than for loud, and, in consequence of fewer stops being in use, there is less chance of notes being out of tune.

Continual pumping of the swell should be avoided; it should only be used when needed. Few things are more difficult to a beginner than to produce a long slow crescendo and diminuendo. Use the swell only when there is a *musical* reason for doing so. Besides, opening the Swell when it is coupled to Great Organ stops upsets the balance of tone.

An organist should sometimes get a friend to play to him, and go himself into the building and listen.

DEFECTIVE TONE.

Defective tone and faulty speech (supposing the pipe to have been properly made and voiced) is caused by dust or dirt in the windway; the pipe being split, or having a hole in it; by a leaking or too lengthy or small conveyance, or by its being out of place; by defective action; insufficient touch, the pallet not opening fully; slide not fully drawn; the pipe being nipped or damaged at the lip, top, or windway; the languid being too high or too low; the mouth of the pipe not having sufficient speaking room; the stopper loose or dropped down; a pipe being robbed of its wind by another one speaking which stands too near—(this is a defect in building); insufficient pressure of wind,—this is a very rare defect, and only likely to occur by accidentally losing in transit a weight or two of the bellows. (Each wind-chest might be marked with its proper pressure of wind.)

Defective speech may be caused by an escape of wind at the foot of the pipe, in consequence of the pipe swaying from the upright position through the longest of them not being stayed at the upper end; or from the rack-board rising and lifting the pipes from their holes. Very often the rack-boards are too slight or are split. (The rack pillars are sometimes screwed into the upper boards and the rack-boards nutted up.)

The pipes are sometimes overblown; in this case the feet of wooden pipes must be additionally packed, or blocked up sufficiently to make the note even, and in metal pipes the metal surrounding the hole lightly tapped or coned to make the hole smaller.

Occasionally (especially in old instruments) an open pipe will be unsteady in tone, and wave of itself, defying the efforts of the tuner until he discovers the source of the waving. Unless there is something wrong with the tone producing portions of the pipe, it is probably caused by the metal or wood being too thin to withstand the vibration, or possibly by being shaded or requiring to be shaded a trifle at the mouth. If it should be a metal pipe, try turning it round; or staying it up firmly by tying it to the nearest pipe or wood work. If a wooden pipe, a strut or stretcher may be placed inside the pipe from side to side, simply cut in tight. A piece of ordinary sticker rod sharpened to fit the wind-way and stuck therein at the side of the pipe is sometimes used to steady the tone of pedal pipes.

Some reed stops have shades at the top for regulating the *power*, and consonance of the tube. But these shades are sometimes closed by those who imagine they exist for tuning purposes, so as to prevent the pipe speaking at all.

The pipes of reed stops must not be blown into by the mouth, as moisture injures the vibrator, but

they may be sounded by exhaustion of the air by suction at the open end, or that of the lower portion of the tube when the upper part is detached.

Sometimes the hook of a large wooden pipe will *rest* on the hook rail, and prevent the pipe foot from fitting properly.

AN ESCAPE OF WIND

can generally be easily traced by the noise it makes in escaping, but it is not unusual, even when the bellows appear to be sound, for wind to run or be drawn back into the feeders, through the valves in the middle board of the bellows being curled upwards; this can be discovered by filling the bellows and holding the hand under the valves of the feeders when the feeders are at rest, as these valves would also probably be leaky, but if they are not, one of them must be lifted a little by the finger. In this case new valve-leathers are necessary for the middle board.

Sometimes a double thickness of leather is used for valves, but one thickness of good leather is better. The object of using two thicknesses is that one thickness should counteract the curling of the other, but two thicknesses are *more* likely to curl than one if but little care is taken in selecting the leather and in glueing them together.

Leakages in bellows, wind trunks, etc., can be easily discovered and stopped: in case the trunks or the front boards of the wind-chests do not bed up properly they must be fitted and re-faced until they do. If there is much leakage at the holes in the metal plate of the wind-chest through which the pull-down wires move, larger wires must be used.

Occasionally a leakage occurs at the waste valve which is now generally inserted in the middle board of the bellows, and, when the bellows is full, pulls up by a tape attached to the upper board of the bellows, the tape being fastened to the length required by a pin tightly wedged in a hole. The valve should be accessible from the upper board of the bellows.

REGULATION OF ACTION.

One of the first things to attend to in the regulation of action is to see that all roller arms, squares, and backfalls stand at the correct angle, the roller arms to stand at right angles to the roller board when the keys are half way down, and squares and backfalls in corresponding positions, and in perfect line. When this adjustment has been made, the touch can be made deeper or fleeter bodily, in those organs which are provided with thumb screws at the ends of the backfalls for that purpose. But if

this provision does not exist, and much regulation or deepening of the touch is required, the thumper must be taken out, or propped up at the ends so as to be well clear of the keys; this can be done by wedging it up from the two extreme keys; (which can be regulated after the others have been done,) otherwise the thumper would prevent the keys rising until a sufficient number of keys were regulated to lift it, and the regulation would be very uncertain as no guide would exist, and a deal of ciphering would ensue. Having propped up (or removed) the thumper, regulate the two end white or natural notes (next to the notes wedged down,) to the depth of touch required. Assuming the angles and positions of the roller arms, etc., to be correct, this regulation must be done by the buttons attached to the pull-down wires or trackers. Now take a straight edge and regulate the naturals to it when placed on the two regulated keys, keeping the keys in the centre of the key-board well up to the straight edge, or a trifle rounding; this allows for wearing down; the edge may be shot a trifle hollow. The sharps may now be regulated so that the upper surfaces of the keys (behind the sharps) are exactly flush with those of the naturals, which can easily be determined by touch as well as sight. Now replace the thumper and regulate the two end keys, and try each key (naturals and sharps) by

lifting them to ascertain if they all bed up to the thumper. After this, put the wind in, and test for ciphering, easing any notes which cipher; now press gently upon the thumper, having a light winded stop drawn, (Fifteenth,) and notice if it makes any note or notes speak; if so, ease them.

Be sure to leave clearing room for a coupler to come into action without lifting the keys of the manual to which it is coupled. For a Swell to Great coupler the touch of the Swell must be less than, or at any rate not exceed, that of the Great, or this lifting of the keys will arise, and the touch of the Swell will determine the depth of the Great when the coupler is drawn, which of course is wrong in principle, and liable to cause ciphering and some action of the coupler when it is not drawn. But too much clearing room or difference in depth of touch of the manuals will cause a certain amount of false action to take place when the coupler is used. When each manual is regulated try all couplers, and regulate them. All couplers must be regulated so as to be correct when the keys are *down*. In all regulation, the sticker, tracker, or wire must be held fast (by pliers if necessary,) whilst the button is being turned.

Propping up the thumper is better than taking it out, as there is less liability of the other portions of the action becoming disconnected accidentally by stickers falling out, etc.

When a sticker requires to be put in, the action must be sufficiently eased back or disconnected, or the sticker wire may be taken out and threaded through the backfall into the sticker after placing it in position.

Those couplers which act upon the pull-down wires may be regulated at the point of action by the eye, or in some cases they can be regulated up until they cipher, and then eased back clear. The amount of rise and fall of coupling backfalls should equal or slightly exceed the depth of the necessary action required, or the coupler might act slightly when it is not drawn. In no case should couplers affect or determine the depth of touch of the keys. Pedal stops may be regulated by the eye, or until they cipher, and then be eased back. Roller arms and squares which have two buttons to them should not be nipped too tightly by the buttons on account of the sweep they describe. In all cases the correct lines and angles of action should be preserved.

The touch of a mechanical action deepens in cold damp weather. (See Ciphering.)

CIPHERING ;

that is, a pipe or pipes sounding when it or they ought not to, may arise from a number of causes. Supposing the wind-chest to be sound, ciphering

cannot occur unless the pallet is open, or slightly open, except the face of the pallet is damaged, or the bars above surrounding it are unequally swollen or shrunken, or out of place, which last is not very likely to happen; or it is possible that the pallet does not sufficiently cover the orifice; this latter fault may generally be remedied by altering the guide pins of the pallet. Grit, or some foreign substance may be upon the pallet; a button may be screwed up too tightly—notice if the key is too high or hard against the thumper. The pallet may hang in the direction of guide pins. The pull-down wire may not work freely. The pallet-spring may be too weak; take it out with a pallet-spring tool and open the legs of the spring to strengthen it, or insert a new spring. The legs or the ends of the pallet-spring may not be true to each other, which may cause the pallet to twist and bed up unequally, or all on one edge. The pull-down wire may be bent. The ends of two adjacent backfalls may rub together, especially if they are much splayed, or too long. A roller may be tight between the studs, or the pins of the roller bent. A backfall may be tight on the centre pin, or it may nip in the beam; tap the backfall lightly on both ends, and over its centre, and rub the backfall gently sideways against the beam. Two buttons may rub together at the roller-arms. A sticker

wire may be bent. Something may have got between the thumper and the key. Candle-wax dropped between the keys may prevent the keys working freely. The key may be swollen; or one of the pins on which it works have become loose; the key may touch the wood slip in front. A coupler when drawn may be screwed up too tightly. A pedal button may have worked off, adding the weight of the pedal coupling action for the pallet-spring to move. The pedal or its action may stick and hold the note down through the pedal coupler. One key may chafe another at its far end. The backfall beam may bend in playing and cause the backfalls to be nipped by the beam. A wooden roller may have warped and require to be weighted to make it balance, or to be replaced by a new one. A sticker may be out of its hole and its wire have become caught by the backfall. A square may be tight, or its pin loose. The bellows may rise too high, or unlevel, and touch a pedal sticker wire.

Ciphering may be caused by too large a screw in the front board of the wind-chest forcing down the wood above the pallet below the surface of the bars.

If any fear of liability to cipher arises, draw a stop which speaks with little wind, as the Fifteenth, and press gently upon the thumper to ascertain if it makes one or two notes in particular cipher; if

so, ease the buttons a trifle, as the weight of the thumper should be borne equally by all the keys, therefore every key should be equally hard up against the thumper ; test them by lifting the keys up to the thumper.

A remote cause of ciphering is that the angle of the roller arms is incorrect, causing the roller, if of wood, to grind or chafe against its neighbour ; the arms should stand at such an angle that they are square to the roller-board when the key is half-way down. (See Regulation of Action.)

The touch of a mechanical action deepens in cold, damp weather, and may cause ciphering by reason of the touch becoming so deep that the upper surface of the keys are prevented from fully rising by the key slip of the manual above ; the wooden slip covering the thumper ; or the desk board. This possible deepening of the touch should be allowed for in regulating up.

In trying to rectify a cipher be careful to find out which note is at fault, as a slight cipher makes the note sound flatter than its correct pitch, and may deceive. The faulty note can generally be ascertained by very lightly touching the key.

Very often a smart tap on the key or pedal will temporarily stop a ciphering, and, as an expedient in an urgent case, a piece of elastic may be attached to some part of the action to help it along for the

time being, but this must be taken off at the first opportunity, and the cause of the ciphering traced from the pallet to the key, testing each separate portion of the movement; first the pallet, then the pull-down wire, etc., etc.

Drawing an additional stop or two upon the defective wind-chest will often temporarily stop a slight ciphering of single notes in the soft stops, by carrying off the wind which would otherwise cause the pipe to sound. Shutting off couplers may also be tried.

Sometimes a key will fall and the note not cipher. This is caused by some part of the action being disconnected. Many of the foregoing remarks apply to the Pedal action.

Paradoxical as it may seem, an organ well built is more liable to cipher for a time than one loosely built.

MEMORANDA.

Mice are particularly fond of organ leather, and do not object to soft pine; it is as well therefore, to set a trap in the organ if there is any suspicion of their presence or visits.

It is always best to send for a competent organ builder except for very simple repairs: tinkering should never be allowed. This applies also to tuning. Organists should see that the work is done properly.

Those ordering an organ would be wise to seek the advice of some capable person before placing the order: they should employ a first-class builder, and pay from £30 to £35 per *speaking* stop; low-priced work is dear.

Sufficient time should be allowed the builder; hurry in building is a great mistake, and has been the cause of much inferior finish to instruments which might otherwise have been good ones.

A higher standard generally, of tone, finish, evenness and tuning, is required in organ building.

Choirmasters may be reminded that the intervals upon the organ vary from just intonation, and that the study of organ tuning would help them in teaching their choirs to sing in equal temperament. The omission of this study is responsible for much faulty singing to the accompaniment of a tempered instrument.

Dissonance is virtually power, and an organ out of tune appears to be much more powerful than when in tune.

No lesser interval than the fifth should be used in the lower part of the compass, the position depending upon the breadth of the harmony.

To gain the best effects from Sub and Super-octave Couplers the hands should be an octave apart—high up the key-board for a Sub-octave, and low down for a Super-octave,—to enable the

octave coupler to fill up the spaces upon the key-board left by the hands.

The organ, as a rule, appears less powerful at the key-board than in the building; this must be allowed for.

A building on a low situation, especially if close to water, is often a good one for sound.

The organ appears louder in a building when empty than when filled with people: soft material, as wearing apparel, modifies the tone, and echo.

Heavy pedal notes, (especially those of Reed stops,) are unsuitable for rapid passages, which are best rendered by smaller pipes.

Combinations of stops are problems in acoustics.

In playing with a pneumatic action it is necessary to exaggerate the accent and phrasing.

The distance of the organ from the choir, and the speed of the action, must be taken into account, and the organist must play slightly in advance, or in front as it is termed, to be with the choir, or to lead them.

Chattering panels or window lights should be tightened.

Avoid jerking the keys. See that the stops are fully drawn, and the keys fully put down.

Organs are sometimes furnished with a crescendo and diminuendo pedal, which acts by drawing and closing the stops in rapid succession, in their order of pitch and power.

Borrowing from one stop to form part of another is undesirable; the wind coming sometimes from one source, and at other times from another, or from both sources at once, make it impossible for the note to be always in tune. (This fault can be partly averted by the use of check valves and other means.) There is also the disadvantage of upsetting the balance of tone in consequence of only one pipe sounding instead of two. The cost of borrowing would be better spent in purchasing or helping to purchase pipes. The Pedal Organ is somewhat exempt from the faults of borrowing, inasmuch as usually only one note is used at a time; there are also the questions of room and cost in pedal pipes. At the best, borrowing is a faulty makeshift.

Sometimes it is necessary to *mitre* open flue pipes to suit the swell box, or position of the pipe, but the tone is not improved thereby. The lower notes of Reed stops are almost always mitred round at the lower end, which is said to improve the tone, and, if exposed to dust they should be hooded at the top.

As a rough guide to estimating the cost of a new organ, Sir John Stainer suggests allowing about £1 per head of the congregation, or audience.

Space is necessary above an organ.

Metal pipes should be of suitable substance or thickness. Certain thicknesses suit certain stops.

A celebrated organ builder has said that he does not mind what metal is used if the pipes are of good thickness.

The more air is compressed the colder it becomes : this may possibly account somewhat for an organ being out of tune where several pressures are in use, and the temperature varies.

Wind is elastic.

The feet of large wooden pipes are best in the centre of the pipe, to carry the weight, even if they are hooked up; and the wind-chest should be sufficiently large to admit of this, if possible.

With the CC to C (five octaves) compass, the Super-octave Coupler is more effective.

The more numerous the Harmonics—if in proper proportion to one another—the more fascinating the tone of the pipe, but the less can it be used in harmony.

Timber cut “on the quarter,” as it is termed,—that is, radiating from the pith, shows up the grain better, and is less liable to warp or twist. No wood should be used which has the pith in it. If cut on the quarter, the grain of the wood of each section will match the other as the boards are cut off. This is desirable for panel work. All wood should be thoroughly well seasoned.

Where special strength is required in small wood-work the wood should be selected for straightness

of grain, or, better still, be riven out both in breadth and thickness, so as to secure the full benefit of the natural strength of the wood; this precaution also prevents warping and twisting.

There is great variation in the quality of iron, which for organ work should be of fair quality. Best iron is too soft. Mild steel is good.

A mounted cornet is so called because it is mounted higher than the adjacent stops to enable it to speak out.

Allowance for season should be made in fitting the stoppers to large wooden pipes, the sides of which, if the stoppers are fitted too tightly in the winter time, will shrink sufficiently in the summer to cause the stopper to split them, or open the joints of the pipe. It is a good plan to screw each joint of the pipe near the top.

Manual backfall beams should have a thumb-screw at each end for raising and lowering the set of backfalls bodily, to regulate the depth of touch.

In a rectangular pipe the sides of the pipe vibrate to a much greater extent than the back and front. The sides of pipes should therefore be well clear of each other, and not be packed closely together.

Keep the organ dry, and at as even a temperature as possible.

It is advisable to keep a few tools and sundries at the organ; screwdrivers, pliers, hammers, brads,

tacks, screws, Russian tallow, black lead, buttons, tapped wires, string, liquid glue, leather, candle and safety matches, oil, wire, springs, wood, elastic bands, etc., in case of emergency.

In 8ft. pitch the CC open pipe is about 8 feet in length; in 4ft. pitch, the octave above, about 4 feet in length; in 2ft. pitch, two octaves above, about 2 feet in length; and so on.

Sound travels at the rate of about 1125 feet per second, and faster as the temperature rises. This increase of rate of travelling, as distinct from rarefaction, although its result, may have something to do with the sharpening of flue pipes by heat, as an increase of pressure (affecting the rate) also sharpens. (See Reed Stops.)

Sound travels four times as fast through water as through air. Sounds of all pitches travel at the same rate. Metals conduct sound very quickly.

It often happens that the bass of certain stops, whether of open wood, or open or stopped metal, is carried down by means of stopped wood pipes. Instances occur in the Clarabella, Dulciana, Rohr Flute, Harmonic Flute, etc., etc., but a stopped diapason bass is unsuitable for stops of an opposite character or quality of tone, such as Gambas, etc., nor should such be grooved to the bass belonging to another stop.

Slides and wood surfaces moving in contact are black-leaded to lessen the friction.

The number of vibrations of *musical* tones range from 16 to 4,000 per second, but sounds can be distinguished the number of vibrations of which range from 8 to 50,000 per second.

A stone roof reflects sound well; wood absorbs sound.

A **T** reversing pedal is of great use to bring a coupler (as Great to Pedals) on and off.

Some prefer Couplers to be grouped with the draw stops of the manual upon which they are available.

Every building has its sympathetic tone. In a church of moderate size and usual proportions it is frequently near to C# or D.

To put one Swell inside another for the Echo organ is hardly worth doing, as, when playing upon the Echo alone, it matters little which Swell is opened.

In a Fan Trumpet, the pipes are arranged diagonally in the front of the instrument in the form of a fan.

If in playing upon the full Swell with the swell closed for a length of time it affects the pressure of air inside the swell box, an automatic relief valve may be fitted.

Stops of similar character should not be placed closely together upon the same wind-chest, in order to avoid sympathetic influence.

A Double Diapason is better than a Sub-octave Coupler.

Harmonic stopped pipes, discovered by the late Mr. Thynne, a celebrated voicer, speak the twelfth above the prime tone instead of the octave.

Forced tone is poor in quality.

The voicing of an organ should be finished in the building.

The writer advocates the closing of Swells during long periods of time when the organ is not in use, but would recommend that they should be opened, and the swell organs played upon if possible, before the organ is required for use, to equalise the temperature, which might for a time affect the tuning or pitch: it will however become rectified to a great extent by using the organ. Closing the Swell keeps the reeds free from dust, which might do permanent injury. If the organ is in use in a heated building, and a long interval occurs, as in the case of a sermon, set the Swell open meanwhile to equalise the temperature.

Be acquainted with the mechanism of your organ, each builder having his own particular style or method.

Centre pins of stop actions should fit tight in the fork, and pass freely through the arm; they may be secured from working out either by a screw passing through the bent end of the pin into the woodwork;

by a nut and thread; or if of large size, by a feather and mortise. When the holes for centre pins have become worn too large introduce those of larger size; the same with ordinary screws.

There is more art in putting in an ordinary screw than is generally supposed; the screw should pass *freely* up to its head through the wood it is intended to hold, and the thread of the screw should hold firmly in the wood.

Wood shrinks very little in the direction of its length.

The stoppers of wood pipes are best when the grain of the wood follows that of the pipes.

On account of variations of temperature it is well, if possible, to have all manual wind-chests at about the same level. But those portions standing behind may perhaps be a little elevated so as to speak through the front portions more freely.

Leather in contact with metal sets up corrosion.

Theoretically, all dimensions (of length, scale, vibrations, pulsations in tuning, etc.) halve themselves at the distance of the octave above; but in practice—especially in scale, some modification is required in order to procure evenness of power.

In practice the speaking length of a pipe is about one seventeenth shorter than that of the pipe a semitone below, and about one twenty-fifth smaller in scale or dimensions.

Owing to the false scaling of organ pipes the length of a pipe is rather less than half the speaking length of its octave below; this is owing to the increase of scale as the pipes rise in pitch, which has the effect of shortening its length, as a pipe of large scale requires to be shorter than one of small scale, note for note.

It is customary to mark all pieces and parts of an organ which are liable to be reversed; the stoppers of pipes are generally nicked in the handle to denote that the nick is to stand on the same face of the pipe as that in which the mouth is cut.

It is a curious fact that the ear will not tolerate the sharp major thirds in harmony at a low pitch, although the rate of waving or pulsation is much slower than is the case in medium or high pitch.

Mr. H. Willis has invented a thumb piston (or pedal) which reverses the position of a movement each time it is used. It is applied chiefly to the Great to Pedal, and Swell to Great Couplers. If the coupler is off, a touch brings it on, and a second touch takes it off.

Aluminium squares have the advantage of being very light and strong, and are superseding those of phosphor bronze.

The smaller wooden pipes (especially in Pedal work) sometimes have extra long feet in order to give speaking room to larger pipes, the mouths of

which stand behind, and have no speaking room of their own.

Slight alterations have sometimes far-reaching results: carefully consider before you begin operations, what they may be.

It is better for an organ to be in fair use than to be standing idle.

FINE TUNING.

It is impossible to tune a keyed instrument having only twelve fixed sounds in the septave so that all the intervals resulting shall be perfect, or of just intonation. If we start from middle C, and therefrom, by means of fifths and octaves tuned perfect, reach the C above, we shall find that the C so obtained will be considerably sharp to the C below from which we started, and as the octaves cannot be allowed to be wide or sharp,—which error would increase considerably at every octave,—it naturally follows that to obtain pure octaves, each fifth, or some of them, must be tuned flatter, or narrower, than perfect. It is the distribution or adjustment of this inevitable law which constitutes what is known as the temperament: *i.e.* the tempering or deviation of the intervals from perfection or just intonation. If the octaves were allowed to be wide or sharp to ease the fifths, the major thirds

would suffer ; and if the octaves were allowed to be narrow to ease the thirds, the fifths would suffer ; the octaves therefore must be perfect.

We may distribute the flattening of the fifths *evenly* by tuning each fifth narrower than a perfect fifth, placing the semitones at equal distances apart, and making them available for use in all positions in harmony, or as dissonances—this is called Equal Temperament,—and each fifth and common chord of each of the twelve keys is by this method available for use, but slightly out of tune with just or true intonation. Or, we can tune some of the fifths and thirds nearly perfect, so as to bring the easier or more frequently used keys, such as C, G, D, A, F, and B $\flat$ into something approaching just intonation, and throw the error into the more remote keys, such as G $\flat$, D $\flat$, A $\flat$, etc., or indeed into any keys desired. This is Unequal Temperament. There is also a compromise method between this and equal temperament, but that of course is also unequal temperament.

Unequal temperament is very smooth and pleasing in the purer keys, but correspondingly impure and unpleasant in the keys into which the error is thrown. Of unequal temperament it used to be said that each key had its own peculiar colour ; but this was nothing more than the result of imperfections in tuning. In equal temperament no such

colour exists except that which is given to each key by its pitch, and the consequent rate of the pulsations in tuning. The discovery of presence or absence of colour is a good test for tuning in equal temperament. If colour exists apart from pitch the temperament is unequal.

Various devices have been tried to overcome this difficulty of adjustment, such as duplicate pipes and keys,—one pipe and key for G $\sharp$ and another for A $\flat$ for instance,—but as it would require about sixty or seventy sounds in the octave to obtain anything like perfect intervals in each of the twelve keys they have all been abandoned as too complicated for ordinary use; and if the equal temperament tuning is well done there remains no cause for complaint; still, there can be no question of the superiority of just intonation. Approximate equal temperament, the result of inefficient tuning, is open to great objection.

If we take into consideration the fact that each note has a diatonic and chromatic position in scales, and has to stand in harmonic or dissonant relation, as the case may be, to each of the other notes, not only as simple or single notes or intervals, but also as component notes of chords in great variety of harmony, key, position, or inversion, and also as dissonances, we shall see something of the intricacies and complications of equal temperament.

And as the exigencies of modern organ music demand the free and unfettered *use* of all twelve sounds in diatonic and chromatic harmony, transitions, and the use of extreme keys, it is evident that none other than equal temperament will serve or fulfil these requirements.

Not only have the intervals of the fifths (and their inversions, the fourths,) to be considered, but also other intervals, and especially that of the major third, which in equal temperament is perceptibly wide, or sharp. The terms sharp and flat are used because they are recognized as referring to the upper note of an interval, but the terms wide and narrow are preferable, and unmistakable. In reckoning *downwards*, the lower note would be *flat* to the third above, and, in tuning, it is sometimes necessary to reckon the intervals downwards.

The major thirds resulting from tuning in equal temperament are sharp or wide for the following reason: Starting from any note,—middle C of the Principal, 4ft., for instance, and tuning the E above a pure major third, and from the E so obtained tuning G# another pure major third, and from the G# so obtained tuning yet another pure major third, we obtain a B#—not a C; so that three pure major thirds do not fill up the space or measure of an octave, and as in the ordinary key-board B# has likewise to answer for C, which must be in tune

with its octave below, it necessarily follows that the major thirds must, between them, spread out, to fill up the measure of the octave.

Tuning in equal temperament is therefore not so simple a matter as it at first sight appears to be; for although the process of tuning is not a particularly complicated one, complications arise from so many intervals being, or becoming, involved.

No instrument calls for more care in tuning than the organ, not only for the reasons given, but also on account of the sustained character of its tones, and the multiplicity of its pipes. Yet tuning is frequently most slovenly done, "octaves up" and "down" after roughly laying or testing the bearings on the Principal 4ft., being considered by some to be "near enough." By such a system any error in laying the bearings is carried throughout the organ, being duplicated both in stops and octaves.

It is of little practical use to demonstrate tuning by mathematics or figures, except as a guide to assist the ear of the tuner, as, independently of error in carrying them out in practice, the slightest variation from the pitch for which the figures or calculations are made upsets them all, and even if the pitch of the instrument is correct, which is extremely improbable, (the organ cannot easily be altered in pitch like a pianoforte,) it would be virtually impossible to tune by figures, pendulums,

watches or chronographs, and waves. In such a system an error in any one of the tests or instruments used would lead to great trouble, which would probably cause it to be relinquished in favour of a more practical method.

In tuning by a method of mathematics and pendulums, etc., the *eye* has to be used; this would certainly detract somewhat from the attention given by the *ear*: and after all it is the ear which is the more accurate, and which has to be satisfied.

Before commencing to tune, a great many conditions are requisite or desirable.

Settled weather (May, or early in October, if possible); a temperature of about 55° or 60° ; or the mean temperature of the building when in use; a good ear for perception of waves; good cones and tools; absence of noise; a steady blower; a good "tell tale"; sufficient depth of touch at the keys to ensure the pallet opening well; (it is best to err on the side of having too great a depth of touch rather than not enough, as it becomes fleeter by use and can only get deeper by accident, or temporarily by atmospheric variation;) the action must be properly regulated, and in order; the slides must draw fully; test for running or robbing of wind; defective pipes must be made to speak properly and promptly; the shades of the Reed stops must be adjusted for power and consonance; the pressure of wind must

be correct; the bellows must rise level; the concussions or French feeders must be in order; the swell shutters should be taken out,—overnight if possible,—also any panels or doors which do not interfere with or shade the pipes, so as to obtain the same temperature throughout the organ. The full Swell, and in fact the whole of the organ, should be played upon for the same reason. Tuning should not be proceeded with while the sun is shining into the organ; or with heating apparatus or gas in use near the organ. If metal pipes have to be taken out to be rectified the heat of the hand will sharpen them—time must be given them to cool. In short, the entire organ must be perfectly in order, except as to tuning.

All heavy jarring work or hammering must have been done, and if any of the large stopped pipes are much out of tune they had better be tuned as nearly as possible, *pro tem*. All loose stoppers should be tightened. All the pipes should have been cleaned, and no cleaning of the building or sweeping of the walls left till after the organ is tuned.

The means by which the various stops are tuned have already been given in the description of the stops.

Large flue pipes out of tune may be tested as to whether they are sharp or flat by gradually shading the mouth of the pipe with the hand; if by so doing

the pipe is brought nearer or more correctly in tune (or temperament) the pipe requires to be flattened in pitch, but if this makes it worse, the pipe requires to be sharpened. The smaller open pipes may be similarly tested by partly shading the tops of the pipes with the finger.

A more scientific method of ascertaining whether a note is flat or sharp is to test it with its fifth and fourth below or above (or both) already tuned or known to be correct. If it is out of tune it will be noticed that one interval will be too pure at the expense of the other being too impure. This gives the clue at once as to whether it requires flattening or sharpening. For instance, if the note to be tested forms the upper one of the two intervals (fifth and fourth) selected for testing with, and the fifth is found to be too pure, and the fourth too impure, both intervals are wider than they should be, consequently the (upper) note requires to be flattened. If the fourth is too pure, and the fifth too impure it requires sharpening.

When the note to be tested forms the lower one of the intervals it is tested with, the reverse is required in both cases. This method possesses the advantage of defining the error at the keyboard, or by listening, without touching or shading the pipe, and also suggests a test of the notes already tuned or supposed to be in tune, in case any doubt or

difficulty is experienced in detecting the error. It may occasionally happen that the note requiring tuning is too much out of tune for this test to apply. It can of course only occur when the interval is wider than a perfect fifth, or narrower than a perfect fourth.

Mops are sometimes used in tuning Mixtures to temporarily silence the companion pipes belonging to the same note whilst one rank is being tuned, but they should be *finished* without mopping.

It would be much easier, and better, if organ builders would always provide a separate slide for each rank, which could then be tuned singly by disconnecting the slide temporarily from the drawstop action. The intervals composing the Mixture should be tuned *pure* to themselves and to the fundamental note.

Reeds may be taken to require sharpening with a rise in the temperature, and *vice versa*.

For *very minute* alterations of pitch in Reed Stops the shades may be very slightly altered to bring the note *perfectly* dead in tune—this is termed “easing the shades.” (Refer to “Reed Stops.”)

It is usual, and will be found easier, to lay the bearings of, and tune soft stops, such as the Keraulophon and Dulciana, quite separately after obtaining the middle C from the Principal, but if they are so done, each note must be thoroughly

tested afterwards with the Principal. The upper octaves of softer and more acute stops than the Principal, such as the Stopped Diapason, Fifteenth, etc., are usually tuned from the octave below upon the same stop, and the lower notes of Reeds are more quickly tuned if held with the octave above already tuned, upon the same stop. The reason for this is that it is difficult to tune a pipe accurately if it is much softer or louder than the note from which it is being tuned. In all cases the tests mentioned later must be applied before being left.

In attempting to tune a high note from its octave below the ear is apt to be satisfied whilst the note is yet flat.

In case of any robbing of the wind of one pipe by the wind of another pipe standing near which is sounding, the only thing to be done is to tune it with the stop or stops it is mostly used with.

Running of the wind along the slide from one note to another can only be remedied by screwing down the upper board, or properly re-fitting the slider, but the disagreeable result (humming) does not manifest itself so much if two or more stops are drawn upon the same wind-chest.

Organ builders call all black notes *sharps*.

If a metal pipe has to be taken out whilst tuning it must be left to cool. Or if any panel work shades the pipes it must be placed in position before tuning, if possible.

Large pipes may be partly tuned by turning them round towards other pipes and thus shading them, or giving them more room to speak in, according as they require flattening or sharpening. But as a rule the mouths of pipes should stand clear of obstruction.

It is a great mistake to imagine, that, *because one has a good ear*, he is competent to tune; for the good ear is very apt to lead him astray in attempting to obtain too pure intervals.

It is necessary to be familiar with *perfect* intervals to be able to judge of the amount of the deviation from perfection.

In learning to tune, the intervals are sometimes first tuned perfect, and then (before proceeding to the next interval,) flattened or sharpened as required.

Absence of so called colour in keys (apart from pitch) is the result of even tempering. Unisons and octaves must have no pulsation, wave or beat.

Now, if we hold two notes tuned to a *perfect* fifth and slightly alter the pitch of one of them we shall hear a waving, beat, or pulsation, instead of the two sounds being melted into one as they appeared to be before alteration; and as the imperfection, or distance from just intonation increases, the waving becomes faster, and slower as it approaches the pure interval.

It is the discernment and adjustment of this waving, or pulsation, which constitutes the art, or rather the science, of tuning.

Before beginning to tune, all the fifths should prove to be a trifle narrower than perfect fifths and the fourths a trifle wider than perfect fourths, —the fourth being rather more imperfect than its *adjacent* fifth, for this reason:—the fourth *below* a given note should pulsate or wave at an equal rate with its inversion the fifth above the same given note; and from the fact that as the intervals rise in pitch the rate of the waving or pulsation quickens, it is evident that the fourths must wave slightly faster than their adjacent fifths. To make this clear at once: Suppose we hold middle C, and tune the G above a trifle flat, (a narrow fifth,) and also tune the G below a trifle flat, (a wide fourth,) so that the two intervals wave at an equal rate with the C, as they should do; the fourth below the upper G ($\frac{G}{D}$), must, in consequence of the rise in pitch causing the pulsations to become faster, be a slightly more imperfect interval than its *adjacent* fifth ($\frac{G}{C}$).

With the order of intervals reversed (fifth below and fourth above,) we find that the fourth *above* a given note pulsates at twice the rate of the fifth below the said given note, being equal in rate of pulsation to the *octave* (above) of the fifth.

N.B.—The equal rate of pulsation of the fourth below a given note with the fifth above the same given note is no proof whatever that the *rate of pulsation* of either interval is correct as regards *temperament*; it merely indicates that the *octave* is true, the two extreme notes being equally related in the matter of pulsation to the intervening one.

Pulsations in tuning follow the law of vibrations as in pitch, and double their rate at the distance of the octave above. The consequence is that no two intervals of the same degree should pulsate at the same rate, but evenly quicken, as the pitch rises, to double the rate at the distance of an octave. Equal *temperament* is rather an unfortunate term, as the *tempering* of intervals in tuning is anything but equal to the ear. It is the distance of the semitones apart from each other which is equal. Even *temperament* is a better term.

In an early number of the "*Musical Standard*," a correspondent gives the following calculation of the rates of the pulsations of the intervals required in laying the bearings within the octave, C=264 to C=528 vibrations per second, (about medium pitch).

Beats per minute	per calculation	53·654	80·299	60·225
	practically	53½ G . .	80 G . .	60 A . .
264 vibr. per second=C C			D . .	D . .

90.133	67.600	100.938	75.878	56.844
90 A E	67½ B E	101 B F sharp.	76 F sharp C sharp.	57 G sharp. C sharp
85.074	63.806	95.493	71.619	
85 G sharp D sharp.	64 A sharp D sharp	95½ B flat F	71½ C F	= { 528 vibrations per second.

These rates being for eight feet pitch (Diapasons, Pianoforte, Harmonium, etc.) they must be doubled for four feet pitch (Principal). Such a table is an excellent guide as to the increase of rate of pulsation, and also as for showing the difference between fourths and their adjacent fifths.

A graduated marked tuning tape (fifths on one side and fourths on the other) can easily be made if desirable, or a Pinfold's metronome (which does not tick) can be adjusted for each interval, to give an idea of the rates of pulsation in laying the original bearings.

The correct distribution of the pulsations, or waves, (*averaging* in number 150 per minute in four feet pitch (Principal) or 75 per minute in *eight feet* pitch, viz: from C=264 vibrations per second, to C=528 vibrations per second,) can only be determined by the ear after long experience, or by constant testing through the whole series of the bearings, which must be gone through time after

time, until they are thoroughly satisfactory and stand well in tune; it is a good plan then to leave them for a time—during which the Swell Principal 4ft. can be tuned; and the greatest care must be taken that the two Principals are perfectly dead in tune in unison, and separately correct in bearings; if they do not prove so, there is a faulty interval, or are faulty intervals, which must be discovered, and rectified. In tuning the Principal on the Swell to that of the Great the ear must be so situated for position that both Principals can be equally well heard at the same time. The ear should not be trusted with the head in the swell box.

If the Swell contains more than five or six stops some provision should be made for obtaining access to the pipes standing at the back without reaching over those in front. If space permits, this is best done by having a passage board between the two highest treble notes in the centre of the sound-board, as from this position the bearings and test intervals, although alternating, can be easily reached, but this arrangement necessitates long shutters, or an inconvenient upright if the shutters are made in two lengths. But the upright may be removable. The other alternative is to have the longest pipes in the centre, and shutters or folding doors at the ends of the swell box, in which case the *test* intervals, although easy of access, alternate

from side to side, and necessitate passing to and fro when laying the bearings, but this is a much lesser evil than having to reach over the pipes in front.

In such a case it is usual after laying the bearings to tune the remainder of the pipes in octaves in their order of succession, to avoid passing from side to side, but they must be tested, (when *both* sides have been tuned,) by means of fifths and fourths.

The following are the pitches now in use:—

	per second.
Continental or Normal pitch	C=517 vibrations.
Society of Arts (medium)	C=530 „
Philharmonic (concert)	C=540 „

Strong efforts are now being made to obtain the adoption of one uniform pitch,—the Continental.

Remember that the original bearings are laid in *four feet* pitch, *averaging* about 150 pulsations per minute from middle C to C above.

Continually test the bearings during progress, as some may slightly alter.

Even the heat of the breath or body will affect the pitch.

The preceding laws must be constantly in the mind of the tuner, and followed throughout the compass.

The writer does not approve the use of solid brass tuning cones on account of the liability to injure the

tops and mouths of the pipes, and disturb the voicing, when heavy blows are given.

Ascertain if the middle C of the Principal 4ft. on the Great Organ is in tune by testing it thoroughly with its octaves, fifths, and fourths, and also with the general pitch of the organ ; if it is not, tune it by dividing its pitch between its fifths and fourths above and below, and by comparison with the general pitch of the organ. Notice when you *have* tuned it whether the top of the pipe is coned inwards, or spread out, too much, also whether the metal pipes generally are coned inwards, or spread out ; if they are it denotes that the present pitch is probably slightly flatter or sharper than originally, and the pitch may be very slightly altered to avoid the coning over, or spreading out, of the tops of the majority of the metal pipes.

Now hold middle C of the Principal 4ft. on the Great with the G above, and tune the G slightly flat, or narrower than a perfect fifth. (107 pulsations per minute.)

Hold the same G with the D below, and tune the D slightly flat, or wider than a perfect fourth. (160 p. p. m.)

Hold the same D with the A above, and tune the A slightly flat. (120 p. p. m.)

Hold the same A with the E below, and tune the E slightly flat. (180 p. p. m.)

Hold the same E with the B above, and tune the B slightly flat. (135 p. p. m.)

Hold the same B with the F $\sharp$ below, and tune the F $\sharp$ slightly flat. (202 p. p. m.)

Hold the same F $\sharp$ with the C $\sharp$ *below*, and tune the C $\sharp$ slightly flat. (152 p. p. m.)

Hold the same C $\sharp$ with the G $\sharp$ above, and tune the G $\sharp$ slightly flat. (114 p. p. m.)

Now hold the middle C with the F above, and tune the F slightly sharp. (143 p. p. m.)

Hold the same F with the A $\sharp$ above, and tune the A $\sharp$ slightly sharp. (191 p. p. m.)

Hold the same A $\sharp$ with the D $\sharp$ below, and tune the D $\sharp$ slightly sharp. (128 p. p. m.)

When this is done correctly, this D $\sharp$ should prove to be a slightly wide fourth with the G $\sharp$ above, (170 p. p. m.,) which can be tested by holding the finger over the G $\sharp$ pipe, and (gradually) shading it to flatten it slightly, when such slight temporary flattening should cause it to sound a perfect fourth.

Do not trust the ear without this test, as it might turn out to be a slightly *narrow* fourth, in which case the intervals were tuned more imperfect than there is occasion for. For the same reason it must not be a pure fourth, if so, it must be set right by distributing the error, which may be done by working backwards throughout the series of bearings. Should it prove to be too wide a fourth, the intervals, or some of them, have been tuned too pure.

By this process the position of each note is "laid" or derived from within the compass of one septave, and is consequently free from any error of derivation by transmission, as might be the case if their positions were determined by tuning from fifths and octaves only.

Before proceeding further, test all the major (and minor) thirds or their inversions in this septave, and if any of them are found to be unpleasant intervals, the bearings are incorrect; for instance, if F and the A above is *too* wide a major third, it is certain that one or both notes are in error: which must be traced out and rectified, and thoroughly tested.

When these bearings are right, hold middle C and the C above, and tune the octave, afterwards testing the upper C with the F and G below (fifth and fourth already tuned), and, if correct, it will wave with each nearly equally, but not quite—the fifth being a slightly better interval than the fourth, —and it must not be left till such waving is so divided, when it will prove to be a dead or pure octave to the C below.

This process must be repeated with the C $\sharp$ and the remainder of the notes upwards, testing each one with its fifth and fourth below already tuned, and it must not be left if any error arises by a note altering or being wrong until the error is dis-

covered, and every bearing, both original and derived, is strictly correct.

When the pipes alternate from side to side, both sides must be tuned before these tests can be applied; but if the pipes are tuned in chromatic order, they can be applied as the tuning proceeds.

It may with some appearance of truth be argued that if the octaves are tuned so that no discrepancy can be detected, surely that is sufficient; but such discrepancies quickly reveal themselves in double octaves, and in testing with fifths and fourths already tuned. The ear cannot guarantee absolute accuracy in octaves. One great advantage of testing is that it checks the previous tuning at the earliest opportunity afforded by secondary means, and reveals at once any inaccuracy or alteration, thus avoiding the discomfiture caused by discovering errors late, and after a deal of work has been fruitlessly done.

The tuning must stand these tests in any case, therefore, after the bearings have been laid, they may as well be employed first as last, as it is requisite to ascertain whether a pipe requires sharpening or flattening to avoid unnecessary coning.

The uppermost notes may be given the turn towards being a trifle sharp—approaching perfect fifths—as they easily flatten.

Now hold the B below middle C and tune it from the octave above, and as the ear *cannot be trusted*

to tune octaves *perfectly*, test it afterwards with the F# and E above, its fifth and fourth already tuned, and divide the wave as before between the F# and E, when it should prove to be a dead octave.

Proceed similarly with the A# and every note downwards, testing each for its bearings with its fifth and fourth above already tuned.

After this is done—that is, the entire compass of the Principal tuned—test every note with its octaves, fifths, fourths, major and minor thirds, minor and major sixths, minor sevenths, and tenths, above and below, and in double octaves. The tenth is an excellent test. So is a succession of common chords in chromatic order.

Beware of altering a note—although it must be done if required. Directly a note is altered to improve one interval another interval suffers.

Now leave these bearings to settle down, and give the ears a rest, as they will become tired, and go “bad.” Then test the bearings again.

The Principal 4ft. of the other manual or manuals may now be tuned to that of the Great—dead in tune—and separately subjected to the same tests and processes as the Principal on the Great, and left to settle down.

It will now be comparatively easy to tune each stop to the Principal on the Great, or to the Principal of the manual to which it belongs, continually testing with the Principal on the Great.

After tuning the Principals it is best to tune the stops in their order upon the soundboard, (which generally follows the order of the drawstops,) so as to avoid as much as possible reaching over a stop or rank of pipes after it has been tuned.

To avoid continually passing from one side of the organ to the other, the pipes may be tuned in their order of succession upon each side.

And as each stop is tuned, it must afterwards be tested separately for its own bearings and intervals throughout its compass, and must also be dead in tune with the Principal on the Great.

When the tuning is considered to be finished it is well to test it as a huge mixture by drawing all the stops, and if any note be found out of tune, ascertain, by pushing in the stops separately, which one is at fault and rectify it.

After tuning by the method given above it should be impossible to find a bad test interval on any stop, or at any pitch; and although this is a severe test, it is the standard which should be aimed at.

Every note within reasonable compass should sound pleasantly with its fifths, fourths, thirds, sixths, minor sevenths and tenths, and octaves should be pure.

It may be urged that as the pitch of organ pipes is so easily disturbed by external influences, fine tuning is labour in vain. The answer to that is, that

equal temperament at its best (being but a compromise) is already in error, any increase of which is unpleasant to the ear. Also that outside disturbances are mostly of a temporary nature; and that fine tuning will bear such disturbances much better than approximate tuning will. As a matter of fact no one accustomed to fine tuning will be satisfied with that which may be described as the skeleton system of tuning.

ANOTHER METHOD OF LAYING THE BEARINGS BY
FIFTHS, AND OCTAVES DERIVED BY FOURTHS.

Hold middle C of the Great Principal 4ft., and tune the G above slightly flat.

Hold the same C with the G below (its fourth, and the inversion of the fifth), and tune the G slightly flat until it waves at an equal pace with the fifth already tuned, and is a dead octave to the G above.

Now from the G below middle C tune the D above slightly flat. There is no occasion *now* to tune the octave below to the D, as it is desirable to keep the original bearings near the middle of the key-board.

From D tune the A above slightly flat.

From the same D tune the A below slightly flat until it waves equally with the D and A above, and proves a dead octave as before.

From this lower A tune the E above slightly flat.

From the same E tune the B above slightly flat.

From the E tune the B below slightly flat as before.

From this B tune F# above slightly flat.

Tune the octave F# below as before, and from it tune the C# above slightly flat.

From the same C# tune the G# above slightly flat.

Tune the octave G# below as before, and from it tune the D# above slightly flat.

From this D# tune the A# above slightly flat.

Tune the octave A# below as before, and from it tune the F above slightly flat.

Tune the octave F below as before, when it should prove to be an evenly narrow fifth with the middle C from which we started.

See that it *is* narrow by shading the F pipe with the finger to slightly flatten it temporarily, when it should give a perfect fifth.

Do not trust the ear to tune the octaves without testing the interval of the fourth below the subdominant for waving equally with the fifth above.

The octaves upwards and downwards must be tuned and tested for fifths, fourths, etc., as by the previous method.

This method seems preferable to the other for accuracy, as the data for making the fifths and

fourths to wave equally is *definite*, and gives the actual mathematical fourths. Its only drawback is, possible error in tuning the octaves; in doing which great care must be taken that the fourths and fifths described wave equally. Do not forget that the intervals wave faster as the pitch rises, and *vice versa*.

It is scarcely necessary to say that the foregoing systems of tuning are equally applicable to the Pianoforte, Harmonium, American Organ, or other keyed instrument, provided the 8ft. rate of pulsation is adhered to; and it may be added that a bichord pianoforte is especially useful in learning to tune, as the strings can be easily adjusted (one string of the two being temporarily damped) without injury to the instrument.

ALTERATION & RE-CONSTRUCTION OF THE ORGAN.

MANY old organs possess excellent pipes, and Great organ sound boards, in good preservation. In such cases ascertain which parts or pipes are serviceable, and plan your new scheme or specification so that all the good parts may be re-used, —and reject the inferior work. Unnecessary or defective stops can be taken out, and replaced by new stops of greater usefulness, subject to width of slide and space.

If the organ has a superabundance of “top,” a Twelfth can be replaced by a Flute, or a Sesquialtera by a Gamba; or a too small Swell sound board and Swell box can be utilised for a Choir sound board (with Swell,) and the Swell pipes be re-used in a new Swell. In such a case, a Dulciana and Flute can be transferred from the Great to the Choir organ, and a Gamba and Harmonic Flute inserted in their stead; or a Clarionet from the Great can be transferred to the Choir, and a Trumpet be substituted.

Pedal pipes of short compass can be completed in compass to 42 notes, thus giving the octave, etc., etc.

If space permits, stops of too small scale may perhaps be shifted upwards one or two pipes, and be cut down and re-voiced, a new pipe or two being added at the bottom of the compass.

With G organ sound boards, the holes, channels, and pallets below CC can be utilised, and the pipes can be transplanted downwards, and will then have more speaking room, and a better supply of wind; and the compass upwards will not perhaps need extension so far as the sound board is concerned; and if the scale of any particular stop is considered to be too small, its pipes may be placed a semitone or more higher than those of the other stops, and be cut down to the required pitch, and re-voiced, thus virtually increasing the scale. (The action of course must be altered to suit the new positions of the pipes, unless it lends itself to the sound boards being shifted bodily towards the treble, or the keys towards the bass.)

If in C sound boards it is desirable to lengthen the compass, a short separate wind-chest with sliders (connected to the corresponding sliders) must be made, but it is doubtful if the pipes of the *larger* stops can be shifted upwards to increase the scale.

With these possibilities in view, draw up a suitable and complete scheme or specification of what

the organ is intended to be when completed, and let any money which may be expended upon it tend towards its ultimate completion according to the scheme laid down; provision being made, and space being left for future work and insertion of pipes, if funds are low. This is a much better plan than repairing and renewing worn out parts, and then discovering that necessary stops, couplers and movements cannot be added or inserted without forfeiting previous expenditure.

With careful thinking out on these lines it is easily seen that it is quite possible to obtain a good organ, modernised, not only at a lower cost than new, but also possessing the advantage of preserving good old pipes, and sound workmanship.

Look well to the capacity of the bellows, and the condition of the sound-boards and wind-chests.

WORKING SPECIFICATION.

It is quite unnecessary when employing organ builders of the highest class to do more than draw up a complete list or specification of the stops, couplers, accessories, etc., etc.; but when a more detailed specification is thought to be desirable, the following may possibly be of use.

SIAM HOUSE,
SUDBURY, SUFFOLK,
January 1st, 1898.

SPECIFICATION of Works requiring to be done in
building an organ for———of———.

GENERALLY.

All materials to be the best of their respective kinds, and of ample substance; and the workmanship throughout to be of the highest class and finish. The same to be subject to the approval of———who is appointed to superintend the building and erection of the instrument, and whose instructions are to be followed; and the

said——is to have access to the instrument at all reasonable times during its progress and erection.

In case of any dispute, the matter is to be referred to an expert arbitrator (*to be agreed upon by both parties,*) whose decision shall be final.

The organ is to be so planned and constructed as to allow of easy access to the separate parts and movements, and ample room is to be provided for all requirements.

It is understood by the provisions of this specification that the amount of the estimate or contract shall include all work, materials, carriage, and incidentals which may be necessary to the completion and erection of the instrument, and no extras will be allowed unless accompanied by the written order or authority of the aforesaid ——, and the organ will not be deemed to be complete until it is erected and fine tuned ready for use; inclusive of a bench or stool for the performer.

The organ is to be completed ready for use on or before the ——day of——, and in case of failure as to time, a fine of——per—— may be levied upon the builder at the discretion of the said——, who shall likewise be at liberty to grant an extension of time to the builder upon reasonable grounds being shown to him: but in case of unreasonable delay the said——shall be at liberty to employ a competent builder to complete the instrument, and deduct the cost of such completion from the amount of the contract; and any agreement relating to extension of time shall thereby be rescinded.

After the erection of the organ, the voicing is to be finished to the requirements of the building;

such voicing to result in an even and characteristic quality of tone of the respective stops; suitable power, and a proper balance of tone in combination.

The organ is to be kept in order and tuned for a period of twelve months from the date of its completion free of extra charge, and if any defect arises within that time from faulty construction, materials or workmanship, the same is to be rectified at the expense of the builder, and in case of his refusal so to do, the aforesaid——shall be at liberty to employ another competent builder, and deduct the cost as before mentioned; and the sum of——of the contract price may be retained until the expiration of the twelve months, for that specific purpose.

The builder will be required to sign an agreement, and (if requested) give a guarantee for the due completion of his contract.

[State the periods of payment upon the signed certificate of the person appointed to superintend the organ.]

The Organ Committee do not bind themselves to accept the lowest or any tender.

Sealed tenders to be addressed and delivered to——, on or before the——day of——.

[It is as well to know that any agreement which may be drawn must be of a personal nature, and must not relate to corporate bodies, as Vicar and Churchwardens, Organ Committee, etc.]

[State whether the platform is to be provided for by the builder or not.]

ORGAN.

The compass of the manuals to be from CC to C, 61 notes, and that of the pedals to be from

CCC to F, 30 notes, and each stop is to be of full compass unless otherwise specified ; the organ to be built to the following specification ;—

[Here give detailed specification of stops, scales, pitch ; zinc, wood, pure tin, spotted metal, plain metal, (in no case less than one-third tin,) number of pipes, couplers, composition pedals, pistons, vents, pressure of wind, swells, tremulant, etc., etc.]

When giving the scales of stops, specify at which pipe half diameters are to be reached, or give the scale for the various C pipes, otherwise the pipes may diminish too rapidly, although the lower pipe may be of the scale specified.]

The Console, Keys, Drawstops, Desk, Pedals, Composition Pedals, fittings and accessories to be of the best description, and to be in accordance with the Resolutions and Recommendations of the Council of the Royal College of Organists, and the case to be of well seasoned ——— to a design approved by———. The case to be provided with removable panels, for ready access to the interior of the instrument.

The framework of the organ to be of———, free from large knots or shakes, and to be of good substance, well bolted and braced, and to be clear-sized and twice varnished.

The bellows to be of sufficient capacity to supply ample wind for the full organ coupled up, and to be of best materials and workmanship, and provision to be made for easy access to all valves.

[If blown by water, square rising feeders to be provided. Provide also for French feeders or additional bellows, engines and fittings.]

The sound boards, wind chests, trunks, etc., to be ample in dimensions, and of the most approved construction, the upper boards, sliders, and table to be of mahogany, and accurately fitted, the pallets to be well felted and leathered, and double pallets to be provided for the—— lower notes of the compass.

The action to be of the kind known as [*tracker, backfall, tubular pneumatic, pneumatic lever, electro pneumatic,*] and all parts and movements to be the best of their respective kinds, to be well bushed, [*aluminium or phosphor bronze bushed squares, iron (bushed) roller arms, etc.,*] and to be practically noiseless when in use.

All pivots of movements to be well and truly turned, and brass, gun metal, or hard wood bearings to be used as may be requisite for the respective movements. Hard wood to be used for all wood movements, and where usual; and all parts usually varnished to be clear sized and twice varnished.

The drawstop action to be of the kind known as [*trundle and lever, pneumatic, etc.,*] and all composition pedals to be double-acting and self-recovering.

Concussion bellows to be provided for each manual wind chest.

The swell box to be of solid pine — inches in thickness, the shutters to be [*horizontal, vertical, or balanced,*] and to open fully, the same to be operated by the cow-heel action, to ensure a gradual crescendo and diminuendo. The Swell box to be *lined with paper, or varnished*, and the ends to have *swell shutters, or folding doors*.

The wood pipes to be of the very best description both as to materials and workmanship, [*state*

as to pine, mahogany, etc.,] and to be clear sized and twice varnished, and carefully voiced.

The metal pipes to be likewise of the best description, and carefully voiced to suit the building. [*State if necessary as to tin, spotted metal, plain metal, or hard rolled zinc, soldered without the use of acid.*]

Special attention is to be given to the voicing of the Reed stops.

The above sketch is only intended to give an idea of what may have to be done when unfortunate financial considerations render it advisable.

SPECIFICATIONS.

BY THE WRITER.

Every organ should have its Specification drawn to suit the building for which it is designed, and the balance, power, and character of tone required should be carefully studied.

No organ should have less than two manuals, each having a compass of five octaves, an independent Pedal organ of thirty notes, and all necessary couplers and accessories.

The Compass of five octaves for the Manuals is advocated for the following reasons :—

Adaptability for C under C position for pedals.

Greater facility in playing vocal bass on pedals.

Increased range of keyboard.

Effectiveness of super-octave coupler.

Completion of five octaves.

Low additional cost.

Each manual stop should be of full compass (without borrowing).

Failing this, do not break the compass at Tenor C, but carry it down to Gamut G (or F).

No. I.

Two Manuals, Swell and Choir, CC to C.

SWELL.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	7 Bourdon	16 tone	42
2 Gamba	8	61	8 Octave (by Coupler) 8	„	
3 Principal	4	61	COUPLERS.		
CHOIR (in a swell).			9 Swell to Choir.		
4 Salicional	8	61	10 Swell to Pedals.		
5 Clarabella	8	61	11 Choir to Pedals.		
6 Lieblich Flute ...	4	61	Two Composition Pedals.		

Swell Pedals so arranged that both can be used together.

SPECIFICATIONS.

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No. II.

Two Manuals, Great and Swell, CC to C.

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	8 Bourdon	16 tone	42
2 Wald Flute, or Clarabella	8	61	9 Octave (by Coupler)	8	„
3 Flute Harmonique	4	61	COUPLERS.		
SWELL.			10 Swell to Great.		
4 Open Diapason ...	8	61	11 Great to Pedals.		
5 Lieblich Gedact ...	8	61	12 Swell to Pedals.		
6 Gamba.....	8	61	(Swell super-octave if desired.)		
7 Gemshorn	4	61	Three Composition Pedals.		

No. III.

Two Manuals, Great and Swell, CC to C (for power).

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	8 Bourdon (strong)	16 tone	42
2 Clarabella	8	61	9 Octave	8	„
3 Harmonic Flute...	4	61	COUPLERS.		
SWELL.			10 Swell to Great.		
4 Open Diapason ...	8	61	11 Great to Pedals.		
5 Gamba.....	8	61	12 Swell to Pedals.		
6 Principal	4	61	13 Swell super-octave (upon itself).		
7 Cornopean	8	61	Three Composition Pedals.		

No. IV.

Two Manuals, Great and Swell, CC to C.

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	10 Bourdon	16 tone	30
2 Clarabella	8	61	11 Violoncello	8	30
3 Dulciana	8	61	COUPLERS.		
4 Harmonic Principal	4 soft	61	12 Swell to Great.		
SWELL.			13 Great to Pedals.		
5 Open Diapason ...	8	61	14 Swell to Pedals.		
6 Lieblich Gedact ...	8 tone	61	15 Swell super-octave.		
7 Keraulophon ...	8 wood bass	61	Four Composition Pedals.		
8 Gemshorn ...	4	61			
9 Cornopean or Oboe	8	61			

No. V.

Two Manuals, Great and Swell, CC to C (soft organ).

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	11 Bourdon	16 tone	42
2 Clarabella	8	61	12 Octave (by Coupler) 8	„	
3 Dulciana	8	61	COUPLERS.		
4 Flute	4	61	13 Swell to Great.		
5 Clarionet & Bassoon 8		61	14 Great to Pedals.		
<i>(No. 5 in a separate Swell Box.)</i>			15 Swell to Pedals.		
SWELL.			16 Swell super-octave.		
6 Open Diapason ...	8	61	Four Composition Pedals, one of		
7 Lieblich Gedact ...	8	61	which forms a Choir Organ upon		
8 Keraulophon	8	61	the Great.		
9 Gemshorn (principal) 4		61	<i>(Dulciana, Clarabella, Flute.)</i>		
10 Oboe	8	61			

No. VI.

Two Manuals, Great and Swell, CC to C (for power).

GREAT.			SWELL—continued.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	10 Cornopean	8	61
2 Wald Flute, or			11 Oboe	8	61
Clarabella	8	61	PEDAL, CCC to F.		
3 Gamba	8	61	12 Open Diapason or		
4 Principal or Har. Flute 4		61	large Bourdon ...	16	42
5 Trumpet or Clarionet 8		61	13 Octave (by Coupler) 8		
SWELL.			COUPLERS.		
6 Double Diapason	16 tone	61	14 Swell to Great.		
7 Open Diapason ...	8	61	15 Great to Pedals.		
8 Stopped Diapason	8 tone	61	16 Swell to Pedals.		
9 Principal	4	61	17 Swell super-octave.		

Four Composition Pedals.

VII.

Two Manuals, Great and Swell, CC to C.

GREAT.			SWELL—continued.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	14 Fifteenth or Piccolo	2	61
2 Violin Diapason...	8	61	15 Cornopean	8	61
3 Clarabella	8	61	16 Oboe	8	61
4 Dulciana	8	61	PEDAL, CCC to F.		
5 Harmonic Principal	4	61	17 Open Diapason	16	42
6 Fifteenth (soft) ..	2	61	18 Bourdon	16 tone	42
7 Trumpet or Clarionet	8	61	19 Octave (by Coupler)	8	„
SWELL.			COUPLERS.		
8 Double Diapason	16 tone	61	20 Swell to Great.		
9 Open Diapason ...	8	61	21 Great to Pedals.		
10 Rohr or Hohl Flute	8	61	22 Swell to Pedals.		
11 Keraulophon	8	61	23 Swell super-octave.		
12 Voix Celeste	8	49	Four Composition Pedals.		
13 Principal	4	61			

Small Three Manual Organ. Similar to Nos. 1, 2 or 3 in every respect, but having three manuals, the one corresponding to the Great Organ (centre manual) being merely a set of keys permanently coupling the Swell to the Choir. The advantages are, Three-manual practice, Coupler always ready, Choir organ available for accompanying a Coupled Solo.

No. VIII.

Three Manuals, but Two Wind-chests, Swell and Choir, CC to C.

Great Organ. Merely a Manual permanently coupling the Swell and Choir.

SWELL.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	7 Bourdon	16 tone	42
2 Gamba	8	61	8 Octave (by Coupler)	8	„
3 Principal	4	61	COUPLERS.		
CHOIR.			9 Swell to Pedals.		
4 Dulciana or Open			10 Choir to Pedals.		
Diapason	8	61	Two Composition Pedals.		
5 Clarabella	8	61			
6 Flute	4	61			

No. IX.

Three Manuals, Great, Swell, and Choir, CC to C.

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	10 Bourdon	16 tone	42
2 Stopped Diapason	8	61	11 Octave (by Coupler)	8	„
3 Principal	4	61			
SWELL.			COUPLERS.		
4 Open Diapason ...	8	61	12 Swell to Great.		
5 Gamba	8	61	13 Swell to Choir.		
6 Gemshorn	4	61	14 Choir to Great.		
CHOIR.			15 Great to Pedals.		
7 Dulciana	8	61	16 Swell to Pedals.		
8 Clarabella	8	61	17 Choir to Pedals.		
9 Flute	4	61	Three Composition Pedals.		

No. X.

Three Manuals, Great, Swell, and Choir, CC to C.

GREAT.			PEDAL, CCC to F.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	11 Bourdon	16 tone	30
2 Wald Flute (strong tone)	8	61	12 Violoncello	8	30
3 Principal ...	4	61			
SWELL.			COUPLERS.		
4 Open Diapason ...	8	61	13 Swell to Great.		
5 Lieblich Gedact ...	8 tone	61	14 Swell to Choir.		
6 Gamba	8	61	15 Choir to Great.		
7 Gemshorn ...	4	61	16 Great to Pedals.		
CHOIR.			17 Swell to Pedals.		
8 Dulciana	8	61	18 Choir to Pedals.		
9 Clarabella (soft) ...	8	61	19 Swell super-octave (on itself).		
10 Lieblich Flute ...	4	61	Four Composition Pedals.		

No. XI.

Three Manuals, Great, Swell, and Choir, CC to C.

GREAT.

	<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61
2 Wald Flute.....	8	61
3 Principal	4	61
4 Piccolo (soft)	2	61

SWELL.

5 Open Diapason ..	8	61
6 Lieblich Gedact...	8	61
7 Gamba.....	8	61
8 Gemshorn	4	61
9 Cornopean	8	61

CHOIR.

10 Dulciana	8	61
11 Clarabella ...	8	61
12 Flute	4	61
13 Clarionet	8	61

[No. 13 in a separate Swell Box.]

PEDAL, CCC to F.

	<i>ft.</i>	<i>pipes</i>
14 Violone	16	42
15 Bourdon	16 tone	42
16 Octave (by Coupler)	8	

COUPLERS.

17 Swell to Great.
18 Swell to Choir.
19 Choir to Great.
20 Great to Pedals.
21 Swell to Pedals.
22 Choir to Pedals.
23 Swell super-octave (on itself).

Five Composition Pedals. -

No. XII.

Three Manuals, Great, Swell, and Choir, CC to C.

GREAT.

	<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61
2 Wald Flute.	8	61
3 Gamba.....	8	61
4 Principal.....	4	61
5 Fifteenth.....	2	61
6 Trumpet.....	8	61

SWELL.

7 Double Diapason	16 tone	61
8 Open Diapason ...	8	61
9 Lieblich Gedact ...	8 tone	61
10 Violin Diapason ..	8	61
11 Principal	4	61
12 Twelfth	2 $\frac{2}{3}$	61
13 Fifteenth	2	61
14 Cornopean	8	61
15 Oboe	8	61

CHOIR (in a Swell Box).

16 Salicional or Open D.	8	61
17 Dulciana	8	61

CHOIR—continued.

	<i>ft.</i>	<i>pipes</i>
18 Keraulophon ..	8	61
19 Clarabella	8	61
20 Flute	4	61
21 Gemshorn	4	61
22 Clarionet	8	61

PEDAL, CCC to F.

23 Open Diapason	16	30
24 Violone	16	30
25 Bourdon	16 tone	30
26 Violoncello	8	30

COUPLERS.

27 Swell to Great.
28 Swell to Choir.
29 Choir to Great.
30 Great to Pedals.
31 Swell to Pedals.
32 Choir to Pedals.
33 Swell super-octave.
34 Tremulant to Choir.
Eight Composition Pedals or Pistons

No. XIII.

Three Manuals, Great, Swell, and Choir, CC to C.

GREAT.				CHOIR—continued.			
		<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>	
1 Double Diapason	16	tone	61	24 Keraulophon ...	8	61	
2 Open Diapason (1)	8		61	25 Dulciana	8	61	
3 Open Diapason (2)	8		61	26 Echo Gamba ...	8	61	
4 Stopped Diapason	8	tone	61	27 Flute.....	4	61	
5 Gamba	8		61	28 Gemshorn.....	4	61	
6 Principal..	4		61	29 Piccolo	2	61	
7 Harmonic Flute...	4		61	30 Clarionet	8	61	
8 Twelfth	2 $\frac{2}{3}$		61				
9 Fifteenth.....	2		61				
10 Trumpet	8		61				
SWELL.				PEDAL, CCC to F.			
11 Contra Gamba or				31 Open Diapason	16	30	
Double Diapason	16		61	32 Violone... ..	16	30	
12 Open Diapason ...	8		61	33 Bourdon	16	tone 30	
13 Lieblich Gedact ..	8	tone	61	34 Principal	8	30	
14 Gamba	8		61	35 Violoncello	8	30	
15 Dulciana	8		61	36 Fifteenth	4	30	
16 Voix Celeste	8		49	37 Trombone.....	16	30	
17 Principal.....	4		61				
18 Fifteenth	2		61				
19 Mixture, 3 Ranks			183				
20 Cornopean	8		61				
21 Oboe	8		61				
CHOIR (in a Swell).				COUPLERS.			
22 Salicional or Open				38 Swell to Great.			
Diapason	8		61	39 Swell to Choir.			
23 Clarabella	8		61	40 Choir to Great.			
				41 Great to Pedals,			
				42 Swell to Pedals.			
				43 Choir to Pedals.			
				44 Great Super-octave.			
				45 Swell Super-octave.			
				46 Choir Sub-octave.			
				47 Tremulant to Choir.			
				Nine Composition Pedals or Pistons.			

Very small Four Manual Organs may follow nearly similar lines to those of Three Manuals, and One Manual may consist of a permanent coupler as before mentioned.

No. XIV.

Four Manuals, Great, Swell, Choir and Echo, CC to C.

GREAT.			ECHO (in a Swell).		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	12 Gamba	8	61
2 Stopped Diapason	8	61	13 Vox Humana ...	8	61
3 Principal	4	61	PEDAL, CCC to F.		
SWELL.			14 Bourdon	16 tone	42
4 Open Diapason ...	8	61	15 Octave (by coupler)	8	„
5 Gamba.....	8	61	COUPLERS.		
6 Gemshorn	4	61	16 Swell to Great.		
7 Cornopean	8	61	17 Swell to Choir.		
CHOIR (in a Swell).			18 Choir to Great.		
8 Dulciana	8	61	19 Great to Pedals.		
9 Clarabella ...	8	61	20 Swell to Pedals.		
10 Flute	4	61	21 Choir to Pedals.		
11 Clarionet	8	61	22 Tremulant to Echo.		

Four Composition Pedals or Pistons.

No. XV.

Four Manuals, Great, Swell, Choir and Echo, CC to C.

GREAT.			ECHO (in a Swell).		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	61	13 Dulciana ..	8	61
2 Wald Flute.....	8	61	14 Gamba	8	61
3 Principal	4	61	15 Vox Humana ...	8	61
SWELL.			PEDAL, CCC to F.		
4 Open Diapason ...	8	61	16 Bourdon	16 tone	30
5 Hohl Flute.....	8	61	17 Violoncello	8	30
6 Gamba.....	8	61	COUPLERS.		
7 Gemshorn	4	61	18 Swell to Great.		
8 Cornopean	8	61	19 Swell to Choir.		
CHOIR.			20 Choir to Great.		
9 Dulciana	8	61	21 Great to Pedals.		
10 Clarabella	8	61	22 Swell to Pedals.		
11 Flute	4	61	23 Choir to Pedals.		
12 Clarionet.....	8	61	24 Swell Super-octave.		
			25 Tremulant to Echo.		
			Six Composition Pedals or Pistons.		

No. XVI.

Four Manuals, Great, Swell, Choir and Echo, CC to C.

GREAT.			ECHO.		
	<i>ft.</i>	<i>pipes</i>	(In a Swell.)		
1 Open Diapason			<i>ft.</i>	<i>pipes</i>	
(large scale)	8	61	17 Dulciana	8	61
2 Wald Flute (large			18 Stopped Diapason	8	61
scale)	8	61	19 Gamba	8	61
3 Gamba (powerful)	8	61	20 Vox Humana ...	8	61
4 Principal (large scale)	4	61			
5 Piccolo	2	61	PEDAL, CCC to F.		
			21 Open Diapason	16	30
			22 Bourdon	16 tone	30
			23 'Cello.....	8	30
SWELL.			COUPLERS.		
6 Open Diapason ...	8	61	24 Swell to Great.		
7 Lieblich Gedact ...	8	61	25 Swell to Choir.		
8 Keraulophon	8	61	26 Choir to Great.		
9 Principal	4	61	27 Great to Pedals.		
10 Fifteenth.....	2	61	28 Swell to Pedals.		
11 Cornopean	8	61	29 Choir to Pedals.		
12 Oboe	8	61	30 Swell Super-octave.		
			31 Tremulant to Echo.		
CHOIR.			Seven Composition Pedals		
13 Salicional	8	61	or Pistons.		
14 Clarabella	8	61			
15 Flute	4	61			
16 Clarionet.....	8	61			

SPECIFICATIONS.

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No. XVII.

Four Manuals, Great, Swell, Choir and Solo, CC to C.

GREAT.			SOLO.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon	16	tone 61	25 Concert Flute ...	8	61
2 Open Diapason ...	8	61	26 Orchestral Oboe	8	61
3 Clarabella	8	61	27 Tuba	8	61
4 Violin Diapason...	8	61	28 Vox Humana (in		
5 Principal	4	61	a Swell)	8	61
6 Fifteenth	2	61	PEDAL, CCC to F.		
7 Trumpet	8	61	29 Open Diapason	16	30
SWELL.			30 Violone	16	30
8 Double Diapason	16	tone 61	31 Bourdon	16	tone 30
9 Open Diapason ..	8	61	32 Principal	8	30
10 Röhre Flute	8	61	33 Violoncello	8	30
11 Keraulophon	8	61	34 Trombone	16	30
12 Voix Celeste	8	49	COUPLERS.		
13 Principal ..	4	61	35 Swell to Great.		
14 Twelfth	2 $\frac{3}{4}$	61	36 Swell to Choir.		
15 Fifteenth	2	61	37 Choir to Great.		
16 Horn or Cornopean	8	61	38 Solo to Great.		
17 Oboe	8	61	39 Solo to Choir.		
CHOIR.			40 Great to Pedals.		
18 Contra Gamba ...	16	61	41 Swell to Pedals.		
19 Open Diapason ...	8	61	42 Choir to Pedals.		
20 Dulciana	8	61	43 Solo to Pedals.		
21 Clarabella	8	61	44 Swell Super-octave.		
22 Flute	4	61	Tremulant to Vox Humana.		
23 Piccolo	2	61	Nine Composition Pedals or		
24 Clarionet	8	61	Pistons.		

Larger Four Manual Organs may consist of a judicious selection from larger specifications, the fourth manual being a Solo or Echo organ as required.

[*By kind permission of the Editors of "The Organist and Choirmaster."*]

ORGAN IN S. GEORGE'S MISSION CHURCH, BROCKLEY,

Built by Mr. Eustace Ingram, Liverpool Road,
London.

GREAT, CC to G, 56 Notes,
4 Stops.

	<i>ft.</i>
1 Open Diapason	8
2 Höhl Flöte.....	8
3 Dulciana	8
4 Flauto Traverso.....	4

SWELL, CC to G, 56 Notes,
4 Stops.

5 Violin Diapason.....	8
6 Lieblich Gedackt	8
7 Geigen Principal	4
8 Oboe	8

PEDAL, CCC to F, 30 Notes,
1 Stop.

9 Bourdon	<i>ft.</i> 16
-----------------	------------------

COUPLERS.

10 Swell to Great.
11 Swell to Pedals.
12 Great to Pedals.
Two Double Acting Composition Pedals to Great.
Tubular Pneumatic Action to Pedals.

ORGAN IN SANDRINGHAM CHURCH, NORFOLK,

(*Presented by H.R.H. The Prince of Wales,*)

Built by J. W. Walker & Sons, 27, Francis St., Tottenham
Court Road, London.

GREAT, Compass, CC to G in
Alt., 56 Notes.

	<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	56
2 Dulciana ...	8	56
3 Wald Flute(Stopped Bass)	8	56
4 Principal	4	56
5 Stopped Flute	4	56

SWELL, Compass, CC to G in
Alt., 56 Notes.

	<i>ft.</i>	<i>pipes</i>
6 Salcional (Ten. C), Grvd. into Stopped. Diapason	8	44
7 Stopped Diapason	8	56
8 Echo Gamba (Metal) to Ten. C, Gedact Wood Bass	8	56
9 Gemshorn	4	56
10 Oboe	8	56

ORGAN IN SANDRINGHAM CHURCH, NORFOLK—continued.

PEDAL.		COUPLERS.	
Compass, CCC to F, 30 Notes.		12 Swell to Great.	
		13 Swell to Pedal.	
11 Bourdon	16 tone ^{ft.} 30 ^{pipes}	14 Great to Pedal.	
Two Composition Pedals to Great.		15 Super-Octave to Swell.	
Two Composition Pedals to Swell.		16 Sub-Octave to Swell.	

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ORGAN IN
ST. BARNABAS, HIGHTOWN, LIVERSEDGE,

Built by Messrs. Abbott & Smith, Leeds.

PEDAL, CCC to F, 30 Notes.		SWELL, CC to A, 58 Notes.	
	<i>ft.</i>		<i>ft.</i>
1 Violone	16	10 Violin Diapason	8
2 Bourdon	16	11 Lieblich Gedact	8
		12 Viola	8
GREAT, CC to A, 58 Notes.		13 Voix Celestes	8
3 Open Diapason	8	14 Gemshorn	4
4 Höhl Flöte	8	15 Oboe	8
5 Dulciana	8	16 Horn	8
6 Harmonic Flute	4	COUPLERS.	
7 Principal	4	17 Swell to Great.	
8 Fifteenth	2	18 Great to Pedal.	
9 Clarionet	8	19 Swell to Pedal.	

[*Per favour of Mr. W. S. Simkin, Sudbury.*]

ORGAN IN
ADWICK-LE-STREET CHURCH, DONCASTER,

Built by Messrs. Abbott & Smith.

GREAT.			SWELL—continued.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Open Diapason ...	8	58	13 Cornopean.....	8	58
2 Stop Diapason ...	8	58	14 Oboe	8	58
3 Dulciana (Grooved)	8	46	PEDAL.		
4 Lieblich Flute.....	4	58	15 Bourdon (Large		
5 Principal	4	58	Scale)	16 tone	30
6 Piccolo.....	2	58	16 Bass Flute.....	8	30
SWELL.			COUPLERS.		
7 Lieblich Bourdon	16	58	17 Swell to Great.		
8 Open Diapason ...	8	58	18 Swell to Pedal.		
9 Vox Angelica (Ten.			19 Great to Pedal.		
C)	8	46	COMPOSITION PEDALS.		
10 Viol-di-Gamba ...	8	58	Three acting on Great and Pedal		
11 Octave	4	58	Organs.		
12 Mixture (3 Ranks)		174	Two acting on Swell Organs.		

[*From "The Organist and Choirmaster."*]

ORGAN AT LONGWOOD HOUSE, NAYLAND,
COLCHESTER.

At this house, the residence of an enthusiastic amateur, Mr. F. W. J. Rees, (of the Indian Civil Service, retired,) is a chamber organ of unique fashion, recently completed by Mr. W. R. Andrew, of Chalk Farm. It may be mentioned that Mr. Rees, as churchwarden, recently procured the restoration, by Mr. Andrew, of all that previous "restora-

ORGAN AT LONGWOOD HOUSE, NAYLAND—continued.

tions" had left of Green's interesting organ in the Parish Church, an instrument handled by the well-known "Jones of Nayland."

The Chamber organ originally consisted of Choir and Swell Organs by Lewis, 1872, a sweet instrument, of course admirably voiced, but not very impressive. Its stops are marked with an asterisk. Afterwards, the *ensemble* was improved by an Open Diapason † placed on the Swell Manual outside of the box. This, however, was awkward in use, and Mr. Casson was consulted. He advised retention of the whole, but removal of the Open Diapason and Mixture to a proper Great Organ, interchangeable with the Choir on the lower manual by "Manual Helps." The 15th rank removed from the mixture and made a separate stop, its place being supplied by a quiet tierce, a rank warmly advocated by Mr. Rees. The Swell Coupler "duplicated" to draw and work with perfect independence for Great and Choir, and a coupling-ventil provided for "Choir to Great." Thus the lower keyboard is, at the will of the performer, absolutely Great or Choir, or both. These alterations, and the bringing up of the stops to the present specification, were effected by Ginns Bros., of Merton, with the exception of the Quintatön and Swell Salicet.

Recently under Mr. Casson's advice the two latter stops were inserted by Mr. Andrew, completing the tonal scheme; one of exceptional grandeur for a chamber organ, and of exceptionally well developed pedal. The Quintatön of 16ft. tone is believed to be the first use of it in this country. Mr. Rees pronounces it an admirable stop, of the utmost utility in combination, in fact, "the flower of the flock;" it is not so thick as even a Lieblich Bourdon, and that its utility has not been recognized is something of a reproach to English builders.

In completing the organ, Mr. Andrew has inserted Casson's "Pedal Helps," thus for the first time bringing a group of Pedal Stops and Couplers into perfect control.

ORGAN AT LONGWOOD HOUSE, NAYLAND—continued.

It is obvious that this can only be done by dissociating them from the manual combination actions, which (if no ready means of dissociation exist) more often provide the pedal bass that is *not* wanted than the bass that is required; and even if dissociable, provide basses only for fixed combinations. The solution of this difficult problem by Mr. Casson is looked upon by him as his *chef-d'œuvre*, and not unjustly; for it seems to approach very closely to a thinking machine. The simple apparatus which acts as the brain of the contrivance is termed a "distributor," and is above the music desk. It is provided with a glass face, so that its curious working can be seen.

Under the centre of each manual is a stud called a "Pedal Help." On touching one, the pedal draw-stops and couplers at once group themselves into the proper pedal bass for the combination of stops and couplers extant upon that manual, and then continue to follow all changes of the stops and couplers of that manual until the "Help" of another manual is touched, when they will similarly conform to that. Nothing eludes its vigilance, or causes a mistake. The lower manual may be changed from Great to Choir, the basses will follow and conform to the combinations of either. If the Swell be coupled, the "Help" of the lower manual will cause the pedals to conform to the united combinations, though that of the upper brings on only its own bass. Thus, if adopted even in such an organ as that at Doncaster, with 25 pedal stops and some 5 pedal couplers, the pedal organ would cause less trouble than the ordinary "commercial" growlery of Open Diapason and Bourdon. The pedal draw-stops and couplers need never be looked at or thought of so far as appropriate basses are concerned, being wanted only for special combinations, for which again the "Helps" would always be admirable auxiliaries.

"The Pedal Helps are a great luxury when the Pedal Organ is as large as it ought to be, since they take all the responsibility," says Mr. Rees.

ORGAN AT LONGWOOD HOUSE, NAYLAND—continued.

The enclosure of the Mixture and Trumpet is, as designed, by Mr. Rees, and it is a very useful arrangement in an organ of this class.

All couplers are grouped and controlled as stops of the division which they augment, in the fashion introduced by Mr. Casson in 1882. That gentleman's greatest regret is that suitable Pedal Stops could not be inserted in the Swell Box, as in the case of the 16ft. Trombone at S. Mary's, Denbigh, 1882.

Mr. Casson has followed his invariable rule of disturbing as little as possible any good pipework or mechanism.

Lower Manual, Great or Choir.

Upper Manual, Swell.

GREAT.

	<i>ft.</i>
1 Contra Violone	16
*2 Open Diapason	8
3 Octave	4
*4 Super Octave	2
*5 Mixture, III ranks }	
6 Trumpet	8

Nos. 5 and 6 in separate Swell.

Swell to Great.

Choir to Great.

Three Composition Pedals.

Manual "Help" (stud to attach Great and detach Choir).

CHOIR.

*7 Salicional ..	8
*8 Vox Angelica (<i>i.e.</i> Small Dulciana)	8
(Tenor C), Bass from 7.	
*9 Lieblich Gedeckt	8
*10 Lieblich Flöte	4
Swell to Choir.	
Manual "Help" (to attach Choir and detach Great).	

SWELL.

11 Quintatön, metal	<i>ft.</i> 16
*12 Open Diapason, Tenor C... (Bass from 13.)	8
*13 Rohr Flöte	8
*14 Gemshorn	4
15 Salicet	2
*16 Oboe	8

PEDAL.

17 Acoustic	32 result.
<i>(i.e., Violone 16ft. to centre C of Pedals, continued on a stopped Quint, and soft open Tierce, II ranks.)</i>	
18 Violone (from Great) ..	16
19a Bourdon (soft power)	16
*19b Sub Bass (No. 19 fully blown and with octave coupler for itself)	16 & 8
20 Violoncello	8

Lower Manual to Pedal.

Upper Manual to Pedal.

Two Pedal "Helps."

ORGAN IN BAPTIST CHAPEL, SUDBURY, SUFFOLK,

Built by Messrs. Hardy & Son, Stockport.

(Specification by T.E.)

GREAT, CC to A, 58 Notes.

	<i>ft.</i>	<i>pipes</i>
1 Open Diapason, metal	8	58
2 Dulciana (to Gamut G) metal	8	51
3 Clarabella, wood...	8	58
4 Principal, metal ...	4	58
5 Flute, wood.....	4	58
6 Fifteenth (not inserted) metal ...	2	58
7 Clarionet, Ten. C, metal	8	46

SWELL, CC to A, 58 Notes.

8 Open Diapason, wood and metal	8	58
9 Lieblich Gedact, wood and metal	8	58
10 Gamba (to Gamut G) metal	8	51
11 Gemshorn, metal	4	58
12 Flautina, metal ...	2	58
13 Cornopean, metal	8	58
14 Tremulant (not inserted)		

PEDAL, CCC to F, 30 Notes.

	<i>ft.</i>	<i>pipes</i>
15 Bourdon, wood...	16	tone 42
16 Pedal Octave ...	8	„

COUPLERS.

- 17 Swell to Great.
- 18 } Great to Pedals.
- 19 } (Two drawstops.)
- 20 Swell to Pedals.
- 21 Swell Sub-Octave (on itself).

Two Composition Pedals to Great, (one forming Choir organ.) Two ditto to Swell.

Tubular pneumatics to Pedal organ. Ratchet Swell pedal.

Bourbons reach half dimensions at 21st pipe.

Blown by a Melvin hydraulic engine, started from keyboard.

Diagonal drawstop jams.

Organ in Wootton Church, Bedford, re-built by Messrs. Trustam, Bedford, to same Specification excepting Sub-Octave.

[From "*Musical News*."]

ORGAN IN BURNBANK UNITED PRESBYTERIAN CHURCH, GLASGOW,

By Messrs. Brindley & Foster, Sheffield and London.

GREAT, CC to A, 58 Notes.

	<i>ft.</i>
1 Open Diapason, metal	8
2 Höhl Flöte, wood and metal	8
3 Dulciana, metal	8
4 Harmonic Flute, wood and metal	4
5 Piccolo, metal	2
6 Clarinet, metal	8

PEDAL, CCC to F, 30 Notes.

7 Open Diapason, wood	16
8 Bourdon, wood	16
9 Flute Bass, wood	8

SWELL, CC to A, 58 Notes.

10 Violin Diapason, wood and metal	8
--	---

SWELL—continued.

11 Lieblich Gedacht, wood & metal	<i>ft.</i> 8
12 Æoline, metal	8
13 Unda Maris, metal	8
14 Gemshorn, metal	4
15 Flautina, metal	2
16 Oboe, metal	8
17 Trumpet, metal	8
18 Tremulant.	

COUPLERS.

19 Swell to Great.
20 Swell to Pedal.
21 Great to Pedal.

Two Composition Pedals to Great Organ.

Two Composition Pedals to Swell Organ.

The action is Brindley and Foster's patent tubular pneumatic throughout.

[From "*Musical News*."]

ORGAN IN HOLY TRINITY CHURCH, STRATFORD, E.

Rebuilt and slightly enlarged by Messrs. Bishop & Son, Marylebone Road, London. The great and swell principals are by Father Smith and the *majority* of the diapason work is probably by him also. The specification stands as follows :—

ORGAN IN HOLY TRINITY CHURCH, STRATFORD—
continued.

GREAT, CC to F.

1 Open Diapason	<i>ft.</i> 8
2 Salicional	8
3 Clarabella	8
4 Flute Harmonic.....	4
5 Principal	4
6 Twelfth	2 $\frac{3}{4}$
7 Fifteenth	2
8 Clarionet	8

SWELL, CC to F.

9 Open Diapason	8
10 Viol di Gamba	8
11 Lieblich	(tone) 8
12 Principal	4
13 Flute Traversiere, (inverted mouths)	4

SWELL—continued.

14 Oboe	<i>ft.</i> 8
15 Trumpet	8

PEDAL, CCC to F.

16 Bourdon	16
17 Open Diapason	16
R. College of Organists Pedals; three Compositions to Great and two to Swell.	

COUPLERS.

18 Great to Pedals.
19 Swell to Pedals.
20 Swell to Great.
21 Swell Super-Octave.

ORGAN IN BERKELEY CHAPEL, MAYFAIR,

Built by J. W. Walker & Sons, London.

GREAT, Compass, CC to A,
58 Notes.

1 Open Diapason ...	<i>ft.</i> 8	<i>pipes</i> 58
2 Wald Flute (Stopd. Bass)	8	58
3 Principal	4	58
4 Harmonic Flute...	4	58
5 Fifteenth	2	58
6 Trumpet	8	58

SWELL, Compass CC to A,
58 Notes.

7 Double Diapason	16	58
8 Open Diapason ...	8	58

SWELL—continued.

9 Stopped Diapason	<i>ft.</i> 8	<i>pipes</i> 58
10 Echo Gamba	8	58
11 Vox Angelica (Ten. C).....	8	46
12 Principal.....	4	58
13 Mixture	2 ranks	116
14 Oboe	8	58

PEDAL, Compass, CCC to F,
30 Notes.

15 Open Diapason	16	30
16 Bourdon	16	30

ORGAN IN BERKELEY CHAPEL, MAYFAIR—continued.

CHOIR, Compass, CC to A,
58 Notes.

	<i>ft.</i>	<i>pipes</i>
17 Gamba	8	58
18 Dulciana	8	58
19 Lieblich Gedact	8	58
20 Lieblich Flute ...	4	58
21 Clarionet	8	58

COUPLERS.

- 22 Swell to Great.
23 Swell to Pedal.

COUPLERS—continued.

- 24 Choir to Pedal.
25 Great to Pedal.
26 Swell to Choir.

Three Composition Pedals to
Great.

Three Composition Pedals to Swell.

Tubular Pneumatic Action to Swell.

[By kind permission of the proprietors of "*Musical Opinion
and Musical Trades Review*."]

ORGAN IN ST. GEORGE'S CONGREGATIONAL
CHURCH, MIDDLESBOROUGH,

Built by Mr. J. J. Binns, Bromley Organ Works, Leeds.

GREAT.

	<i>ft.</i>
1 Bourdon	16
2 Open Diapason	8
3 Hohl Flöte	8
4 Dulciana	8
5 Principal	4
6 Harmonic Flute	4
7 Fifteenth	2
8 Trumpet	8

SWELL.

9 Geigen Principal	8
10 Rohr Flöte	8
11 Salicional	8
12 Voix Celestes	8
13 Geigen Principal	4
14 Piccolo	2
15 Horn	8
16 Oboe	8

PEDAL.

	<i>ft.</i>
17 Open Diapason	16
18 Bourdon	16
19 Octave	8
20 Flute	8

COUPLERS.

- 21 Swell to Great.
22 Great to Pedal.
23 Swell to Pedal.
24 Swell Octave.
25 Swell Sub-Octave.
26 Swell to Great Octave.
27 Swell to Great, Sub.

[From "*The Organist and Choirmaster.*"]

ORGAN IN WESLEYAN CHAPEL, TUNSTALL, STAFFORDSHIRE,

Built by Messrs. Steele & Keay, of Burslem.

It has two Manuals, each of which commendably has a 16 feet Register, and a III rank Mixture; and independent Pedale; and the 24 sounding Stops mentioned below:—

GREAT, 10 Stops, CC to a³, 58 Notes.

	<i>ft.</i>
1 Bourdon, wood	16
2 Open Diapason, metal	8
3 Stopped Diapason, wood ...	8
4 Gamba, spotted metal	8
5 Dulciana, metal	8
6 Principal, metal	4
7 Flute, wood	4
8 Fifteenth, spotted metal ...	2
9 Mixture, III ranks, metal...	
10 Trumpet, metal	8

SWELL, 11 Stops, CC to a³, 58 Notes.

11 Double Diapason, wood ...	16
12 Open Diapason, wood and metal	8
13 Stopped Diapason, wood ...	8
14 Keraulophon, spotted metal	8
15 Voix Celeste, to tenor C, 46 notes, metal.....	8

SWELL—continued.

	<i>ft.</i>
16 Geigen Principal, metal ...	4
17 Piccolo, spotted metal ...	2
18 Mixture, III ranks	
19 Cornopean, metal.....	8
20 Oboe, spotted metal	8
21 Clarion, metal	4

PEDAL, 3 Stops, CCC to F, 30 Notes.

22 Open Diapason, wood.....	16
23 Bourdon, wood.....	16
24 Violoncello, metal	8

COUPLERS.

25 Swell to Great.
26 Swell to Great, Octave.
27 Swell to Pedals.
28 Great to Pedals.
Three Double-action Composition Pedals to Great Organ.
Three Double-action Composition Pedals to Swell Organ.

The Tubular Pneumatic Action (Steele & Keay's system) is applied to the Pedal Organ and Front Pipes.

The Case is of Pine with ornamental pipe sides set at an angle of 45 degrees. The Front is decorated with massive towers at each angle.

Every Stop in the Organ except the Voix Celeste is carried through.

The Draw Stop Knobs are of Rosewood, with large Ivory Registers.

The Shutters of the Swell are perpendicular, and so controlled by a balance Pedal that they may remain open at any point.

[From "*Musical Opinion*."]

ORGAN IN CONGREGATIONAL CHURCH,
BLACKBURN ROAD, BOLTON,

Built by Messrs. Henry Willis & Son, London.

GREAT.

1 Contra Gamba	<i>ft.</i> 16
2 Open Diapason	8
3 Stopped Diapason	8
4 Claribel Flute	8
5 Flûte Harmonique	4
6 Principal	4
7 Fifteenth	2
8 Trumpet	8
9 Clarion	4

CHOIR.

10 Dulciana	8
11 Viola da Gamba	8
12 Lieblich Gedackt	8
13 Claribel Flute	8
14 Viola	4
15 Piccolo	2
16 Corno di Bassetto	8

SWELL.

17 Lieblich Bourdon	16
18 Open Diapason	8
19 Lieblich Gedackt	8
20 Salicional	8
21 Vox Angelica	8
22 Gemshorn	4
23 Flageolet	2
24 Cornopean	8
25 Oboe	8

PEDAL.

26 Open Diapason	<i>ft.</i> 16
27 Bourdon	16
28 Octave	8
29 Bass Flute	8

COUPLERS.

Pneumatic—	
30 Swell to Great.	
31 Swell to Choir.	
Mechanical—	
32 Swell to Pedal.	
33 Great to Pedal.	
34 Choir to Pedal.	

COMPOSITION PEDALS.

Three to Great.
Three to Swell.

Double acting Piston for Swell to Great.
Double acting Piston for Great to Pedal.
Pneumatic Levers.
Hydraulic Engines by Ross Valve Co.
Tremulant to Swell.
Manuals—CC to A.
Pedal—CCC to F.

ORGAN IN ACTON PARISH CHURCH,

Built by J. W. Walker & Sons, London,

Erected 1876, re-arranged and enlarged to present Specification, and Tubular Pneumatic Action added, 1894.

GREAT.			SWELL—continued.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Double Diapason	16	56	22 Oboe	8	56
2 Open Diapason			23 Clarion	4	56
(large)	8	56	CHOIR.		
3 Open Diapason			24 Violin Diapason	8	56
(small)	8	56	25 Lieblich Gedact	8	56
4 Gamba	8	56	26 Dulciana	8	56
5 Hohl Flute	8	56	27 Flute	4	56
6 Principal	4	56	28 Piccolo	2	56
7 Harmonic Flute ...	4	56	29 Clarionet	8	56
8 Mixture, 4 ranks...		224	COUPLERS.		
9 Trumpet	8	56	30 Swell to Great.		
PEDAL.			31 Swell to Choir.		
10 Open Diapason ...	16	30	32 Choir to Great.		
11 Bourdon	16	30	33 Swell to Pedals.		
12 Violoncello	8	30	34 Choir to Pedals.		
13 Trombone	16	30	35 Great to Pedals.		
SWELL.			36 Swell Octave.		
14 Bourdon	16	tone 56	Three Composition Pedals to Great Organ.		
15 Open Diapason ...	8	56	Three Composition Pedals to Swell Organ.		
16 Rohr Gedact	8	56	One Composition Pedal, controlling Great to Pedal Coupler.		
17 Echo Gamba	8	56	Tubular Pneumatic Action to Great, Swell and Choir Organs, and all Manual Couplers.		
18 Vox Angelica (Ten.C)	8	44			
19 Principal	4	56			
20 Mixture, 3 ranks...		168			
21 Horn	8	56			

ORGAN IN ST. PETER'S CHURCH, HINDLEY, NEAR WIGAN,

Built by Edmund Schulze, Paulinzelle, Germany.

GREAT.		CHOIR.	
	<i>ft.</i>		<i>ft.</i>
1 Sub Gamba.....	16	20 Viola	8
2 Bordun	16	21 Flauto Amabile	8
3 Principal Major	8	22 Dolcan	8
4 Principal Minor	8	23 Lieblich Gedact	8
5 Hohl Flöte	8	24 Viol d'Amour.....	4
6 Quint	6	25 Lieblich Flöte.....	4
7 Octave	4		
8 Mixture (3 ranks)		PEDAL.	
9 Sub Posaune	16	26 Principal Bass.....	16
10 Trumpet	8	27 Violon	16
		28 Sub Bass	16
SWELL.		29 Gross Quint	12
11 Lieblich Bordun.....	16	30 Posaune	16
12 Principal	8		
13 Salicional	8	COUPLERS.	
14 Gedact	8	31 Swell to Great.	
15 Octave	4	32 Great to Pedal.	
16 Flöte Harmonic	4	33 Swell to Pedal.	
17 Mixture (3 ranks)		34 Choir to Pedal.	
18 Oboe	8	35 Great Super Octave (1.)	
19 Cornopean	8	36 Great Super Octave (2.)	
		37 Pedal Super Octave.	

[From "The Organist and Choirmaster."]

ORGAN IN PARISH CHURCH, BUXTON.

This Organ may be regarded as one of the finest examples of the work of Messrs. W. HILL & SON, its builders. The Instrument is divided into two parts, one on either side of the Sanctuary, each half projecting partly into the large single nave of the church. Messrs. Hill's latest form of electric action is applied throughout, and exhibits several advances even upon their highly successful electric work at Westminster Abbey.

ORGAN IN PARISH CHURCH, BUXTON—continued.

The Console is detached and movable, and stands on the North side of the Sanctuary. It consists of four manual key-boards, CC to C, 61 notes; and a pedal board of 30 notes. Above the solo manual are disposed the Ivory Stop keys, in a single row of thirty-nine keys, together with a central "Ventil key" (Hill's patent, 22530-96), by which the whole of the Stop keys can be thrown out of action during a performance, and a new combination of stops set, to suit the taste of the player, for a subsequent effect, and this without disturbing the arrangement in use at the time. When the new combination is to be brought into action the Ventil key is actuated, either by finger or by a foot pedal, when the new combination will be instantly substituted for the previous one. The ordinary and most useful permanent combinations of stops are controlled by combination buttons placed below the Swell and Great key-boards. The action of the touches is elastic, light, and instantaneous, and the same for all the key-boards.

Two of Messrs. Hill's Hydraulic engines supply wind from independent feeders, and there are also separate hand feeders. All the electric mechanism is beautifully finished, and pure platinum used for certain contacts, although the current required is very small. The church possesses admirable acoustic qualities, and the effect of the full organ is extremely grand.

The following is the specification:—

GREAT, CC to C.		SWELL, CC to C.	
	<i>ft.</i>		<i>ft.</i>
1 Double Diapason	16	9 Bourdon	16
2 Open Diapason (I)	8	10 Open Diapason	8
3 Open Diapason (II)	8	11 Salicional	8
4 Hohl Flute	8	12 Voix Celeste (C)	8
5 Principal	4	13 Rohr Flute	8
6 Harmonic Flute	4	14 Principal	4
7 Harmonic Piccolo	2	15 Mixture (2 ranks)	
8 Dulciana Mixture (3 ranks)		16 Horn	8
		17 Oboe	8

ORGAN IN PARISH CHURCH, BUXTON—continued.

SOLO, CC to C.		PEDAL—continued.	
	<i>ft.</i>		<i>ft.</i>
18 Harmonic Flute	8	29 Violoncello	8
19 Orchestral Oboe	8	30 Trombone	16
20 Tuba	8	COUPLERS.	
CHOIR, CC to C.		31 Swell to Great.	
21 Dulciana	8	32 Swell to Great (Octave).	
22 Viola di Gamba	8	33 Swell Octave.	
23 Lieblich Gedeckt	8	34 Solo to Great.	
24 Suabe Flute	4	35 Swell to Choir.	
25 Cor Anglais	8	36 Great to Pedal.	
26 Corno di Bassetto	8	37 Swell to Pedal.	
		38 Choir to Pedal.	
		39 Solo to Pedal.	
PEDAL, CCC to F.		Four Pistons to Great Organ and Pedal Organ.	
27 Open Diapason	16	Three Pistons to Swell Organ and Pedal Organ.	
28 Bourdon	16	Ventil key (Hill's patent).	

[From "*Musical Opinion*."]]

ORGAN IN BRAMLEY PARISH CHURCH, LEEDS,

Rebuilt by Mr. J. J. Binns, with a fine oak screen
presented by the builder:—

GREAT.		CHOIR.	
	<i>ft.</i>		<i>ft.</i>
1 Bourdon	16	11 Bourdon	16
2 Large Open Diapason	8	12 Open Diapason	8
3 Small Open Diapason	8	13 Dulciana	8
4 Gedackt	8	14 Lieblich Gedackt	8
5 Principal	4	15 Gamba	8
6 Flûte Harmonique	4	16 Lieblich Flöte	4
7 Twelfth	2 $\frac{2}{3}$	17 Piccolo	2
8 Fifteenth	2	18 Clarinet	8
9 Mixture (3 ranks)			
10 Trumpet	8		

ORGAN IN BRAMLEY PARISH CHURCH, LEEDS—continued.

SWELL.		PEDAL—continued.	
	<i>ft.</i>		<i>ft.</i>
19 Bourdon	16	31 Octave	8
20 Open Diapason	8	32 Flute	8
21 Keraulophon	8	COUPLERS.	
22 Gedackt	8	33 Swell to Great.	
23 Principal	4	34 Swell to Great (Octave).	
24 Mixture (3 ranks)		35 Swell to Choir.	
25 Cornopean	8	36 Choir to Great.	
26 Oboe	8	37 Swell Octave.	
27 Tremulant		38 Swell to Pedal.	
PEDAL.		39 Great to Pedal.	
28 Open Diapason	16	40 Choir to Pedal.	
29 Bourdon	16	COMPOSITION PEDALS.	
30 Quinte	10 $\frac{3}{4}$	Four to Great and Pedal.	
		Three to Swell.	

UNION CHAPEL ORGAN, Highbury, N.,

Built by Mr. Henry Willis, London.

Three Manuals, from CC to A, 58 notes, and Pedal CCC to F, 30 notes.

GREAT.		SWELL.	
	<i>ft.</i>		<i>ft.</i>
1 Double Open Diapason, metal and wood	16	13 Contra Gamba, metal & wood	16
2 Open Diapason (large)	8	14 Open Diapason, metal	8
3 Flauto Dolce (small open) ..	8	15 Lieblich Gedact, metal and wood	8
4 Claribel Flute, wood	8	16 Salicional, metal	8
5 Stopped Diapason, metal...	8	17 Vox Angelica, metal	8
6 Principal, metal	4	18 Gemshorn, metal	4
7 Flute Harmonique, metal..	4	19 Lieblich Flöte, metal	4
8 Twelfth, metal	2 $\frac{3}{4}$	20 Mixture, metal 3 ranks	
9 Fifteenth, metal	2	21 Trumpet, metal	8
10 Mixture, metal 3 ranks		22 Oboe, metal	8
11 Trumpet, metal	8	23 Vox Humana, metal	8
12 Clarion, metal	4	24 Clarion, metal	4

UNION CHAPEL ORGAN, Highbury—continued.

CHOIR.

	<i>ft.</i>
25 Viola D'Amour, metal ..	8
26 Dulciana, metal	8
27 Claribel Flûte, wood	8
28 Lieblich Gedact, metal and wood	8
29 Gemshorn, metal	4
30 Concert Flûte, metal	4
31 Lieblich Flûte, metal	4
32 Corno-di-Bassetto, metal ..	8

PEDAL.

33 Open Diapason, wood....	16
34 Open Diapason, metal ..	16
35 Bourdon, wood	16

PEDAL—continued.

	<i>ft.</i>
36 Principal, metal	8
37 Ophicleide, metal.....	16

COUPLERS.

38 Swell to Great.
39 Choir to Great.
40 Swell to Pedals.
41 Great to Pedals.
42 Choir to Pedals.
Four Composition Pedals to Great.
† Pedal for Great to Pedals.
Three Composition Pedals to Swell.
Tremulant by Pedal.

The above is an example of the advantage of an instrument having ample space above. It stands in an arch of about 60 feet in height, and the distance from the top of the highest pipe to the roof is about 40 feet. The instrument is hidden by an iron screen, no front pipes being visible. All the reeds except the Vox Humana, Oboe, and Corno-di-Bassetto are on heavy wind pressures. The Organ is played by the agency of the Pneumatic Lever with the exception of the Choir Organ, which has ordinary tracker action; and is blown by four water engines, (coupled in pairs,) by Messrs. Watkins and Watson.

ORGAN IN SOUTHWOLD CHURCH, SUFFOLK,

By Messrs. J. W. Walker & Sons, London.

GRÉAT.

	<i>ft.</i>	<i>pipes</i>
1 Double Diapason	16	56
2 Open Diapason ..	8	56
3 Horn Diapason ..	8	56
4 Stopped Diapason		
Bass and Wald		
Flute Treble ..	8	56
5 Principal	4	56

GRÉAT—continued.

	<i>ft.</i>	<i>pipes</i>
6 Flute	4	56
7 Twelfth	2½	56
8 Fifteenth.....	2	56
9 Mixture.. 3 ranks		168
10 Trumpet	8	56
11 Sharp Mixture, 2 ranks		112

ORGAN IN SOUTHWOLD CHURCH, SUFFOLK—continued.

SWELL.			PEDAL.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
12 Double Diapason	16	56	33 Open Diapason ..	16	42
13 Open Diapason ..	8	56	34 Bourdon	16	42
14 Stopped Diapason	8	56	35 Quint	12	42
15 Echo Gamba (lieblich bass).....	8	56	36 Principal	8	42
16 Vox Angelica (tenor C)	8	44	37 Trombone	16	42
17 Principal	4	56	COUPLERS.		
18 Harmonic Flute ..	4	56	38 Great to Pedal.*		
19 Fifteenth	2	56	39 Swell to Pedal.		
20 Mixture, 3 ranks..		168	40 Choir to Pedal.		
21 Horn	8	56	41 Swell to Choir.		
22 Hautboy	8	56	42 Swell to Great.		
23 Double Trumpet	16	56	43 Pedal Octave.		
24 Vox Humana	8	56	* Takes on and off by Pedal.		
25 Sharp Mixture, 2 ranks		112	Tremulant to Swell.		
CHOIR.			Four Composition Pedals to Great Organ.		
26 Salicional	8	56	Three Composition Pedals to Swell Organ.		
27 Dulciana	8	56	Pneumatic action to Great Organ.		
28 Lieblich Gedact ..	8	56	Compass of Manuals CC to G, 56 notes.		
29 Gemshorn	4	56	Compass of Pedals CCC to F, with additional octave to complete octave Coupler, making 42 notes.		
30 Clear Flute	4	56			
31 Suabe Piccolo ..	2	56			
32 Clarionet	8	56			

[*Abridged from the "Scottish Leader."*]

ORGAN IN THE MANSION OF MR. J. MARTIN
WHITE, BALRUDDERY, SCOTLAND,

Rebuilt by Mr. R. Hope-Jones, Birkenhead.

This organ is the work of three hands. It was originally built by Casson; the most notable characters in the voicing are due to Thynne; and it has been reserved for Mr. Hope-Jones to reconstruct it pretty much on the first plan, and to supply the electric arrangements. The swell and solo organs with pedal basses open into a resonance

ORGAN AT BALRUDDERY—continued.

chamber communicating with the music room. The great organ and the greater part of the pedals are below, and the pedal organ is inverted in order to send the tone downward from the organ gallery to the auditorium. The electrical mechanism for admitting the wind, and for opening and closing the shutters which regulate the volume of tone reaching the ear, are of an ingenious, but by no means of an elaborate kind. It is the console which shows the most remarkable simplification and extension of the organist's power. The reader has to imagine a movable console occupying not more than the space of an ordinary harmonium. It is placed in the hall, and has no apparent connection with the organ in the gallery. There are the usual manuals and pedals, but we look in vain for the vast array of side draw-stops. Instead of them, there is, above the manual and in line with it, a row of ivory switches which make or break the electrical contact, and which are so small, and light in their action, as to be made to open or close with the merest touch of the finger. These switches or stop keys are arranged from left to right, beginning with the pedal organ, next the great and solo, followed by the swell and choir; and colours, white, red, and black, are employed to help the eye in distinguishing quickly between the various classes of stops, reeds, or couplers. The console, thus seen, is connected with the organ by a cable an inch or so thick, containing, it may be, many hundreds of fine copper wires; and through this cable the current passes that wakes into life the immense organ above. On putting down a key a tiny metal disc is moved by the electric current about a hundredth part of an inch, and this minute effect was sufficient to cause the pipe to speak. The electric current is very light, two or three dry cells being sufficient. Another innovation is, what is called the "double touch"—for multiplying the resources of the instrument. In other words, the player may depress the keys partially in order to obtain certain effects, or he may depress them fully, and thus call other stops into action without any new

ORGAN AT BALRUDDERY—continued.

operation of the fingers. The structural alterations on the organ were done by Mr. J. R. Miller, organ builder, Dundee and Perth, who is building a large organ for the Gilfillan Hall, Dundee, under the direction of Mr. Hope-Jones.

PEDAL. Compass CCC to F.

	<i>ft.</i>
1 Open Diapason	16
2 Great Bourdon	16
3 Swell Violone	16
4 Ophicleide [first and second touch; partly from Tuba]	16
5 Principal [partly from 16ft. open]	8
6 Swell Viola	8

COUPLERS.

7 Great to Pedal	8
8 Swell to Pedal	8
9 Solo to Pedal	8

GREAT. Compass CC to A.

In Swell Box No. 2, except the Open Diapason, Clarabel and Sourdine.

10 Bourdon	16
11 Open Diapason	8
12 Clarabel	8
13 Sourdine	8
14 Gedact	8
15 Principal	4
16 Zauber Flöte	4
17 Piccolo	2
18 Mixture [five ranks]	

COUPLERS.

19 Swell Sub-Octave to Great	16
20 Swell Unison to Great [first and second touch]	8
21 Swell Super-Octave to Great	4
22 Solo Unison to Great [first, second, and pizzicato touch]	8
23 Solo Super-Octave to Great	4
5 Composition Pedals.	

SWELL. Compass CC to A.

In Swell Box No. 1.

	<i>ft.</i>
24 Violone	16
25 Geigen Open	8
26 Violes d'Orchestre	8
27 Harmonic Flute	8
28 Echo Salicional	8
29 Geigen Principal	4
30 Horn	8
31 Oboe	8
32 Violes Celestes [tenor C] ..	8
33 Vox Angelica [tenor C] ..	8

COUPLERS.

34 Sub-Octave Coupler	16
35 Super-Octave Coupler	4
36 Solo to Swell [second touch]	8
37 Great to Swell [second touch]	8
5 Composition Pedals.	

SOLO. Compass CC to A.

In Swell Box No. 2.

38 Harmonic Flute [8ins. wind]	8
39 Violoncello	8
40 Tuba Mirabilis [8ins. wind]	8
41 Clarinet	8
42 Cor Anglais	8

COUPLERS.

43 Sub-Octave Coupler	16
44 Super-octave Coupler	4

GENERAL ACCESSORIES.

Three Pedal Studs, p. f. ff.
Sforzando Pedal, f, ff.
Stop Switch [Key and Pedal].
Tremulant [Swell and Solo].

[From "*The Organist and Choirmaster.*"]

ORGAN IN HOLY TRINITY CHURCH,
TULSE HILL.

This Instrument has been built to a Specification drawn up by the Organist of the Church, H. Walmsley Little, Esq., Mus. D., Oxon. Dr. Little, who is, by the way, a Fellow, Member of the Council, and Examiner of the R.C.O., has held the position of Organist and Choirmaster of this Church for eleven years. He may be congratulated on the beautiful effect of the combinations designed by him in the Specification. Dr. Little speaks very highly of the manner in which Messrs. Norman & Beard carried out their work. He says, "considering the small size of the Organ Chamber, and the impossibility of having the console detached, or in any other position, it is wonderful that not any part of the Organ is ineffective. The touch is perfect, and answers instantaneously, and although the Church is bad for sound, the voicing has been most carefully looked after." Such a testimonial as this must be very gratifying to Messrs. Norman & Beard. The instrument is tuned to the French Pitch.

The Cost (from figures supplied by Dr. Little).

Organ	...	...	...	£1074
Engines, etc.	...	...	...	84
Oak Cases	...	...	...	142
				£1300

The Expenses in preparing the Chambers, Water, etc.,
totalled to nearly a further £100.

GREAT, 10 Stops.		GREAT—continued.	
	£.		£.
1 Double Diapason, wood	16	6 Principal, metal	4
2 Open Diapason (large) metal	8	7 Harmonic Flute, metal	4
3 Open Diapason (small) "	8	8 Fifteenth, metal	2
4 Höhl Flute, wood	8	9 Full Mixture, 3 ranks, 12,	
5 Corno Flute (closed bass)		15, 22 in Bass, 8, 12, 15,	
metal	8	in Treble, metal	2½
		10 Tromba (Heavy Wind) metal	8

ORGAN AT TULSE HILL—continued.

SWELL, 12 Stops.

11	Lieblich Bourdon, wood ..	16
12	Open Diapason, metal	8
13	Lieblich Gedact, wood and metal	8
14	Salicional, metal	8
15	Voix Celeste (46 notes) metal	8
16	Geigen Principal, metal ..	4
17	Suabe Flute, metal	4
18	Piccolo, metal	2
19	Mixture (3 ranks) 15th, 19th, 22nd, 19 notes. Prin. 12th, 15th to top, metal	
20	Contra Hautboy, metal	16
21	Horn, metal	8
22	Oboe, metal	8

CHOIR, 7 Stops.

23	Dulciana, metal	8
24	Claribel, wood	8
25	Gamba, metal	8
26	Flauto Traverso, metal	4
27	Dulcet, metal	4
28	Flautina, metal	2
29	Clarinet, metal	8

PEDAL, 6 Stops.

30	Open Diapason (large) wood	16
31	Violone, metal	16
32	Bourdon, wood	16
33	Violoncello, metal	8

PEDAL—continued.

34	Flute Bass, wood	8
35	Trombone (on heavy wind) metal	16

COUPLERS, &c.

36	Great to Pedal (2 knobs, 1 each side).
37	Swell to Pedal.
38	Choir to Pedal.
39	Swell to Great.
40	Swell to Choir.
41	Choir to Great.
42	Swell Octave.
43	Choir Sub-Octave.
44	Tremulant.

All Stops run throughout excepting Celeste in Swell.

ACCESSORIES.

Four Composition Pedals to Great Organ acting on part Pedal Organ.
Four Composition Pedals to Swell Organ.
One Reversible Pedal actuating Great to Pedal Coupler.

COMPASS.

Manuals, CC to a3.
Pedals, CCC to f.

Wind Supply.—In addition to the large feeders and main reservoirs placed in a separate chamber below the Organ, separate reservoirs are provided for each soundboard to ensure a steady supply of wind at the different pressures.

Engines.—The two Hydraulic Motors are by Messrs. WATKINS & WATSON.

Action.—The Builders' patent Tubular Pneumatic Action is applied throughout with sliderless soundboards.

ORGAN AT TULSE HILL—continued.

Voicing.—The Diapasons are of large scale, producing a fine full tone. The Flutes throughout the Organ form a characteristic feature, No. 5 in the Great Organ being of very soft tone, invented by Mr. HERBERT NORMAN, and intended to be used as an accompaniment to the solo stops. The Gamba on the Choir Organ is an excellent specimen of its kind. The Reeds are delicately and carefully voiced to suit the Church, the Great Organ Tromba being of large scale and of great power.

Pedal Organ.—The Bourdon and Flute are softly voiced to accompany the soft registers. The Violone pipes form the West front.

Swell Box.—The Shutters open vertically, and are governed by an ordinary Swell Pedal placed over and between B and C.

The position of Pedals and Manuals is according to the regulations of the Royal College of Organists.

The drawstops are placed at an angle of 45°.

The Couplers Swell to Great and Choir to Great operate the Swell Octave and Choir Sub-octave when drawn.

The Organ is tuned to the French normal pitch, viz., C = 522 vibrations, at a temperature of 68° Fahrenheit, and is probably the first completed organ in London specially built (the pipes being of extra length) to that pitch.

Cases.—Two finely carved oak fronts (facing chancel and west), kindly given by two lady members of the congregation, were designed and made by Messrs. NORMAN & BEARD.

ORGAN IN MARYLEBONE PRESBYTERIAN CHURCH, LONDON,

Built by Hele & Co., Plymouth and Exeter.

Tubular Pneumatic.

GREAT.

		<i>feet.</i>	<i>compass.</i>	<i>notes.</i>
1	Double Open Diapason, metal ..	16	CC to G	56
2	Open Diapason, No. 1, metal	8	CC to G	56
3	Open Diapason, No. 2, metal ..	8	CC to G	56
4	Claribel, wood ..	8	CC to G	56
5	Stopped Diapason, wood ..	8	CC to G	56
6	Flute Harmonique, metal ..	4	CC to G	56
7	Principal, metal ..	4	CC to G	56
8	Twelfth, metal ..	3	CC to G	56
9	Fifteenth, metal ..	2	CC to G	56
10	Mixture, 3 ranks, metal ..		CC to G	168
11	Double Trumpet, lower octave prepared for ..	16	C to G	44
12	Posaune, metal ..	8	CC to G	56
13	Clarion, metal.. ..	4	CC to G	56

SWELL.

14	Double Diapason, wood ..	16	CC to G	56
15	Open Diapason, metal ..	8	CC to G	56
16	Gedact, wood ..	8	CC to G	56
17	Salicional, metal ..	8	CC to G	56
18	Voix Celestes, metal ..	8	C to G	44
19	Gemshorn, metal ..	4	CC to G	56
20	Harmonic Piccolo, metal ..	2	CC to G	56
21	Mixture, 3 ranks, metal ..		CC to G	168
22	Contra Fagotto, metal ..	16	CC to G	56
23	Cornopean, metal ..	8	CC to G	56
24	Oboe, metal ..	8	CC to G	56
25	Vox Humana ..	8	CC to G	56
26	Clarion, metal ..	4	CC to G	56

CHOIR.

27	Gamba, metal ..	8	CC to G	56
28	Flauto Traverso, wood ..	8	CC to G	56
29	Dulciana, metal ..	8	CC to G	56
30	Gedact, wood and metal ..	8	CC to G	56

MARYLEBONE PRESBYTERIAN CHURCH ORGAN— continued.

CHOIR—continued.

			<i>feet.</i>	<i>compass.</i>	<i>notes.</i>
31	Lieblich Flute, metal	..	4	CC to G	56
32	Flautina, metal	.. ..	2	CC to G	56
33	Clarionet, metal	.. ..	8	CC to G	56
34	Orchestral Oboe, metal..	.. ..	8	CC to G	56

PEDAL.

35	Sub-Bass, wood	.. ..	32	CCC to F	30
	(Stopped Pipes to GGG. Quint below.)				
36	Open Diapason, wood	.. ..	16	CCC to F	30
37	Bourdon, wood	.. ..	16	CCC to F	30
38	Violone, metal	.. ..	16	CCC to F	30
39	Bass Flute, wood	.. ..	8	CCC to F	30
40	Violoncello, metal	.. ..	8	CCC to F	30
41	Trombone, metal	.. ..	16	CCC to F	30

COUPLERS.

42	Swell to Great.	45	Swell to Pedals.
43	Swell to Choir.	46	Great to Pedals.
44	Swell Octave.	47	Choir to Pedals.

COMPOSITION PEDALS.

Four to Great and Pedals in proportion.

Three to Swell Organ.

Great to Pedals, by reversible Centre Pedal.

Hele's Key Stops fitted to this Organ.

These Key Stops are small ivory levers, made with a sloping surface, on which is clearly printed the name and pitch of each stop. They are hinged at the left-hand corner, and are actuated at the right-hand corner, the movement being a bare quarter of an inch. The Key Stops and Couplers are placed over their respective manuals. The Pedal Organ Key Stops are placed in side jambs, and are duplicated. All composition changes control the Key Stops.

[From Dr. Spark's "*Musical Reminiscences*"—by permission.]

ORGAN IN THE CATHEDRAL, RIPON, YORKSHIRE,

Three Manuals and Pedale, 49 Stops,

By Messrs. Lewis & Co., London.

GREAT, CC to A.

1 Bourdon, wood and metal	...	...	16 feet tone	}	3½ inches wind
2 Stopped Diapason, wood and metal	...	...	8 "		
3 Small Open Diapason, wood and metal	...	...	8 "		
4 Large Open Diapason	...	...	8 "		
5 Hohl-Flöte, wood and metal	...	...	8 "		
6 Principal (small)	...	...	4 "		
7 Octave	...	...	4 "		
8 Octave Quint, wood and metal	...	...	2½ "		
9 Super Octave, wood and metal	...	...	2 "	}	7 inches wind.
10 Mixture	...	...	4 ranks.		
11 Contra Trumpet	...	...	16 feet tone		
12 Trumpet	...	...	8 "		
13 Clarion	...	...	4 "		

PEDAL, CCC to F. Radiating and Concave.

14 Sub Bass, wood	...	...	32 feet tone.	}	About 5½ inches wind.
15 Sub Bass, wood	...	...	16 "		
16 Open Bass, wood	...	...	16 "		
17 Violone, wood	...	...	16 "		
18 Violoncello, wood	...	...	8 "		
19 Flute Bass, wood	...	...	8 "		
20 Trombone	...	...	16 "		7in. wind.

This flute bass is from the old organ st. diap. 8 feet (oak).

CHOIR, CC to A.

21 Liebhich Gedact	...	...	16 feet tone.
22 " "	...	...	8 "
23 Vox Angelica (pure tin)	...	...	8 "
24 Dolce	...	...	8 "
25 Gamba (pure tin)	...	...	8 "
26 Flauto Traverso (harmonic)	...	...	8 "
27 L. Gedact	...	...	4 "
28 Dulcet (from old choir organ diap.)	...	...	4 "
29 L. Gedact	...	...	2 "
30 Clarionet	...	...	8 "

ORGAN IN RIPON CATHEDRAL—continued.

The gedact two feet is stopped up to the top note. The clarionet "goes through." Pneumatic action to great and swell to great. Tubular pneumatic to pedal organ (in side aisles). The metal is all spotted and substantial, even the pedal trombone.

SWELL, CC to A.

31 Bourdon, wood and metal	...	...	16 feet tone.	
32 Rohr Flöte, wood and metal (from old choir, by Gerhard Schmidt)	...	...	8	"
33 Gamba, Viol de (pure tin)	...	...	8	"
34 Voix Celestes (gamba, pure tin) undulating with No. 33	...	...	8	"
35 Geigen Principal	..	...	8	"
36 Rohr Flöte	..	...	4	"
37 Flute Harmonique (tin)	...	...	4	"
38 Geigen Principal	...	...	4	"
39 Flautina	...	...	2	"
40 Mixture	...	...	3 ranks	
41 Contra Trumpet	..	...	16 feet tone.	
42 Trumpet	...	...	8	"
43 Oboe	...	...	8	"
44 Clarion	...	..	4	"

} 3½ in.
wind.

COMPOSITION PEDALS ... 3 to Gt., 3 to Sw., 1 to Gt. to Ped.

COUPLERS ... 1. Swell to Gt. 2. Sw. to Ch. 3. Sw. to Ped. 4. Ch. to Ped. 5. Gt. to Ped.

The three Manual Organs are placed upon the Choir Screen, the Pedal Organ is divided and placed on each side in the Choir Aisles, and connected by Lewis's System of Pneumatics. The Oak Case was designed by the late Sir Gilbert Scott.

[From "*The Organist and Choirmaster.*"]

ORGAN AT ST. BARNABAS CHURCH, PIMLICO.

This Organ, originally the gift of the late Rev. Sir F. A. Gore-Ouseley and his sister, was built by Flight, and was of CCC or 16 feet Manual compass, of which range Sir Frederick was at that time an advocate. It was recon-

ORGAN AT ST. BARNABAS CHURCH, PIMLICO—continued.

structed in 1876, by Messrs. Hill & Son, and was afterwards re-scaled and re-voiced (in 1887) by Mr. William Thynne, and some new stops added. A further contract was undertaken, in 1889, by the Casson Patent Organ Company, Limited. Still more recently, a complete rebuild of the whole instrument was decided upon; the work being entrusted to Messrs. Beale and Thynne, who have repaired and reconstructed the whole of the mechanism on modern lines, besides perfecting still further the voicing.

The following is a list of some of the improvements. The Engine and the whole of the blowing apparatus, that were fixed inside the Organ, have been removed into the Crypt, where there are now two hydraulic engines, and four double action feeders, working noiselessly, while giving an ample supply of wind.

The space thus gained inside the Organ has been used for the better arrangement of reservoirs and trunks, and above these the sound-boards and passage-boards, besides the replanting of some of the large pipes.

An entirely new Console and Draw-stop action have been provided, with new Manual and Pedal keys.

The key-action is tubular pneumatic throughout, on the builders' patent system.

On referring to the Specification, it will be seen that the arrangement introduced by the Casson Co., whereby the Swell can also be treated as a Solo Organ, and for separate Pedal registers to each Organ, have been retained for organists who desire to use them. On the other hand, a switch has been added, whereby the whole of this arrangement can be thrown out of gear, and the Organ treated on the ordinary system by players who prefer this.

The Pedaliers are each manipulated by a movable brass plate, 7 inches long, attached to slips under the Manuals, and the Swell and Solo by two studs under the Bass and Treble halves respectively of this Manual; thus offering greater convenience to the player than the single stud or piston in the centre of the Manual. The Compositions are likewise worked by Pistons instead of Pedals as formerly.

ORGAN AT ST. BARNABAS CHURCH, PIMLICO—continued.

The Solo division of the Great, previously named "Bombarde," has been removed, and another soundboard constructed, with a 6in. wind pressure; the Trumpet and Claribel can therefore be used as Solo Stops from either Great or Choir Manual, and the III Rank Mixture and Clarion Stops on Great, have been removed from the 6in. to the 3½in. pressure. Also the Clarionet in Choir has changed places with the Musette in Swell.

Every pipe in the Organ has passed under the hands of Mr. Thynne, many of the old Flight pipes, owing to their feeble condition, being replaced by new ones of spotted metal.

The Specification of the Organ in its present form is as follows:—

GREAT, 13 Stops.		SWELL—continued.	
	<i>ft.</i>		<i>ft.</i>
1 Bourdon	16	23 Rohrflöte	8
2 Open Diapason	8	24 Echo Salicional	8
3 Open Diapason	8	25 Viole d'Orchestre	8
4 Stopped Diapason	8	26 Principal	4
5 Claribel	8	27 Flautina	2
6 Principal	4	28 Mixture, 3 ranks	
7 Geigen	4	29 Contra Fagotto	16
8 Harmonic Flute	4	30 Horn	8
9 Twelfth	2½	31 Oboe	8
10 Fifteenth	2	32 Clarion	4
11 Mixture, III ranks			
12 Trumpet	8	SWELL PEDAL, 5 Stops.	
13 Clarion	4	*14 Great Bass	16
GREAT PEDAL, 7 Stops.		*15 Contra Bass	16
14 Great Bass	16	*16 Sub Bass	16
15 Contra Bass	16	*17 Quint	10½
16 Sub Bass	16	*19 Flauto Dolce	8
17 Quint	10½	SWELL SOLO, 6 Stops.	
18 Great Flute	8	*23 Rohrflöte	8
19 Flauto Dolce	8	*24 Salicional	8
20 Trombone	16	*25 Viole d'Orchestre	8
SWELL, 12 Stops.		33 Voix Celeste	8
21 Viola (St. b.)	16	*31 Oboe	8
22 Open Diapason	8	34 Clarionet	8
		Tremulant.	

ORGAN AT ST. BARNABAS CHURCH, PIMLICO—continued.

SWELL SOLO PEDAL, 1 Stop.

*16 Sub Bass	16
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CHOIR, 7 Stops.

35 Viola	8
36 Viole Sourdine.....	8
37 Lieblich Gedact	8
38 Flauto Traverso	4
39 Salicet	4
40 Flautina.....	2
41 Musette	8

CHOIR PEDAL, 3 Stops.

*15 Contra Bass	16
*16 Sub Bass	16
*19 Flauto Dolce	8

CHOIR SOLO.

*5 Claribel	8
*12 Trumpet	8

COUPLERS.

Swell to Great.
Choir to Great.
Great to Pedal.
Octave to Swell.
Swell to Pedal.

COUPLERS—continued.

Swell Solo to Pedal.
Sub-Octave to Choir Organ.
Swell to Choir.
Choir to Pedal.

ACCESSORIES.

Four Composition Pistons to Great Organ.
Four Composition Pistons to Great Pedal Organ.
Three Composition Pistons to Swell Organ.
Three Composition Pistons to Swell Pedal Organ.
Pedalier Plate to Great Organ.
Pedalier Plate to Swell Organ.
Pedalier Plate to Choir Organ.
Two Swell and two Solo Studs to Swell Organ.
Three Manuals, Compass, CC to G, 56 notes.
Pedals, Compass, CCC to F, 30 notes.
1. Manual, Choir and Choir Solo.
2. „ Great Organ.
3. „ Swell and Swell Solo Organs.
Hydraulic Engine Starter.

THE DIVIDED ORGAN IN THE PARISH
CHURCH OF ECCLES, LANCS.,

By J. J. Binns, Bramley, Leeds.

Binns' Patent Tubular Pneumatic Action.

The Organs occupy positions fifteen feet above the chancel floor; the north screen contains the swell organ, the south having the great and solo organs, while the pipes

ORGAN IN ECCLES PARISH CHURCH—continued.

of the pedal organ are distributed on both sides. The console stands below at the end of the choir seats, an iron palisade screen separating it from the nave. The tubes follow a very zig-zag course, in passages specially made under the chancel floor, eventually ascending to the platforms, behind the pillars, and are effectively screened from sight. These tubes are ninety feet long to the north organ, and sixty feet to the south organ. The water pressure being insufficient for water blowing, the compressed air is generated by a gas engine, placed with feeders, &c., in an old vestry some distance away. The wind is then conveyed to the different Organs in large zinc trunks placed under the chancel floor. The inside pipes are of spotted metal, the front pipes being of electro-plated zinc.

The length and contorted shape of the tubes, together with the great variation in the distance of the two Organs, presented very great difficulties, which have been successfully overcome. The least variation in the speech of the two sides would have been fatal to the work. Calculations were made with such nicety that when the Organ was tried it answered the extreme tests which the performers subjected it to with the precision of a grand pianoforte. The stop and key action respond to the fingers with great rapidity. Nor does one side speak less accurately than the other; used in conjunction or separately they are equally correct, proving the attack and repetition to be absolutely perfect, the entire instrument being a fine example of the successful application of tubular pneumatics.

GREAT.			SOLO (enclosed in a Swell Box).		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon	16	61	12 Violin-e-Cello....	8	61
2 Open Diapason ..	8	61	13 Gedact	8	61
3 Principal	8	61	14 Flute Douce	4	61
4 Bourdon	8	61	15 Octavin	2	61
5 Flute Harmonique	8	61	16 Clarinette	8	61
6 Flute Harmonique	4	61	17 Orchestral Oboe..	8	61
7 Octave	4	61	18 Vox Humana	8	61
8 Nazard	2 $\frac{3}{4}$	61	19 Tuba	8	61
9 Doublette	2	61			
10 Mixture, 3 ranks..		183			
11 Trumpet	8	61			

ORGAN IN ECCLES PARISH CHURCH—continued.

PEDAL.			COUPLERS.		
	<i>ft.</i>	<i>pipes</i>			
20 Contre Bass	16	30	39 Swell to Great.		
21 Bourdon	16	30	40 Swell Sub to Great.		
22 Quinte	10½	12	41 Swell Octave to Great.		
23 Octave	8	12	42 Solo to Great.		
24 Flute	8	12	43 Swell Octave.		
25 Trombone	16	30	44 Swell Sub-octave.		
26 Trumpet	8	12	45 Solo Sub-octave.		
SWELL.			46 Great to Pedals.		
27 Bourdon	16	61	47 Swell to Pedals.		
28 Open Diapason	8	61	48 Solo to Pedals.		
29 Salicional	8	61	49 Solo to Swell.		
30 Viol d' Orchestre	8	61	50 Tremulant to Swell.		
31 Voix Celestes	8	49	51 Tremulant to Solo.		
32 Gedact	8	61	SUMMARY.		
33 Octave	4	61			
34 Cornet, 3 ranks		183		<i>stops</i>	<i>pipes</i>
35 Bassoon	16	61	Great Organ	11	793
36 Trumpet	8	61	Swell Organ	12	842
37 Hautbois	8	61	Solo Organ	8	488
38 Clarion	4	61	Pedal Organ	7	138
			Couplers, &c.	13	

Three Combination Pedals to Great and Pedal Organs, and three to Swell Organ.

Two balanced Crescendo Pedals.

ST. MARK'S CHURCH ORGAN, LEEDS,

By J. J. Binns, Bramley, Leeds.

Unlike the Eccles instrument, this one is built in one compact case on the chancel floor—upon Binns' patent tubular pneumatic principle throughout. The touch, when the thirteen couplers are in use, is extremely light. The pipes are of spotted metal throughout. The swell and choir organs are in separate swell boxes, and there is no mitreing of pipes. The controlling pedals of both swell and choir organ shutters are placed closely together, so that singly or in conjunction they can be operated by either foot.

ORGAN IN ST. MARK'S CHURCH, LEEDS—continued.

The key fittings are of solid oak, polished, with diagonal drawstops of solid ivory. The couplers are arranged immediately over the highest manual. The wind is generated by two hydraulic engines; there are five double-acting vertical feeders, seventy-five superficial feet,—and a special reservoir containing a corresponding superficial area. From these the wind is transmitted to the various pressure reservoirs in the organ. By these means, steady and regular wind is supplied when all the couplers are in use.

The Organ has the advantage of ample space. It is enclosed in a noble case of wainscot oak. There are two façades, with bays of spotted metal pipes; and the massive carving shoots up into six towers, each surmounted with an allegorical figure. The whole forming an exquisite work in decorated English Gothic style.

GREAT.			PEDAL.		
	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon	16	61	19 Double Open Diap.	16	30
2 La. Open Diapason	8	61	20 Sub-Bass	16	30
3 Sm. Open Diapason	8	61	21 Violone	16	30
4 Gamba	8	61	22 Quint	10½	30
5 Harmonic Flute...	8	61	23 Principal	8	30
6 Octave	4	61	24 Violoncello	8	30
7 Wald Flöte	4	61	25 Flute Bass	8	30
8 Twelfth	2½	61			
9 Fifteenth	2	61	SWELL.		
10 Mixture ... 3 ranks		183	26 Bourdon	16	61
11 Trumpet	8	61	27 Open Diapason ...	8	61
12 Clarion	4	61	28 Salicional	8	61
			29 Stop Diapason ...	8	61
			30 Voix Celestes ...	8	49
CHOIR (enclosed in a Swell Box).			31 Octave	4	61
			32 Harmonic Flute..	4	61
13 Gamba	8	61	33 Piccolo	2	61
14 Open Diapason ...	8	61	34 Mixture ... 3 ranks		183
15 Dolce	8	61	35 Contra Fagotto ...	16	61
16 Lieblich Gedact...	8	61	36 Cornopean	8	61
17 Suabe Flute	4	61	37 Oboe	8	61
18 Clarionet	8	61	38 Clarion	4	61

ORGAN IN ST. MARK'S CHURCH, LEEDS—continued.

COUPLERS.

- 39 Swell to Great.
- 40 Swell to Choir.
- 41 Choir to Great.
- 42 Swell to Pedals.
- 43 Great to Pedals.
- 44 Choir to Pedals.
- 45 Swell Octave.
- 46 Swell Sub-Octave.
- 47 Swell to Great Octave.
- 48 Swell to Great Sub-Octave.
- 49 Great Octave.
- 50 Choir Octave.
- 51 Choir Sub-Octave.
- 52 Tremulant to Swell.
- 53 Tremulant to Choir.

SUMMARY.

	<i>stops</i>	<i>pipes</i>
Great Organ.....	12	854
Swell Organ.....	13	903
Choir Organ.....	6	366
Pedal Organ.....	7	210
Couplers, &c.	15	
Four Combination Pedals to Great and Pedal Organs.		
Three Combination Pedals to Swell Organ.		
One Reversible Pedal controlling Coupler No. 5.		
Two Crescendo Pedals.		

[From "*Musical Opinion*."]

ELECTRIC ORGAN AT ST. JOHN'S CHURCH,
BIRKENHEAD,

Re-built by Mr. R. Hope-Jones.

On entering the church, we see in the middle of the nave (where it has just been carried for our benefit) a neat little oak pannelled console. If we look beyond it we shall see on the floor a little rope about the thickness of two fingers, leading up the aisle towards the east end, where the organ may be seen on either side of the chancel. This, we are told, is the flexible cable (some fifty yards long, containing three hundred and forty-three wires), and it is the only connection between the instrument and the console. As we mount the organ stool, the first peculiarity we notice is the apparent absence of stops. Instead of which are their substitutes, the "stop keys." These are placed immediately under the music desk, and consist of a row of ivory tablets (about the size and shape of dominoes), pivotted on a wire

running through their centres and so arranged that the lightest touch upon the upper ends will cause the stops to speak, while a similar touch on their lower ends will silence them. A very simple and ingenious spring throws them fully on or fully off, so that they cannot rest in middle position, and it becomes perfectly easy to see whether they are on or off. Every stop and every coupler is represented by its little tablet in the long row below the music desk. One imagines at first that this is confusing, and so no doubt it would be but for the practical way in which they are systematized; for not only are they grouped under the departments of the organ which they affect,—viz., pedal, great, swell, and choir; but the little buttons on the surface of each stop key are coloured thus: flue stops white, reeds red, and couplers black. We cannot pass over these couplers without remark, for here, in this unpretentious church organ of only thirty-four speaking stops, we find no less than *nineteen* of them. This demands some explanation, and we find it in the fact that with Mr. Hope-Jones's electric action there is absolutely no limit to the number of couplers which may be arranged, for they depend solely on the touching together of certain wires. He has, therefore, put in all the possible couplers *on and from every clavier*, and has invented a most extraordinary one (which he calls the "swell quint") by means of which he can couple to any manual the whole of the swell organ a fifth below. Those who have not heard the effect of this will shudder at the idea of such an experiment, but it is only necessary to try it to be convinced of its usefulness.

Within the organ there is no mechanism to be seen. It appears at first sight to consist solely of the bellows, soundboards, and pipes. The spaces usually left in such instruments for the mechanism are in this case utilized for vestries, &c. Insulated wires are led in small cables from the organ test boards on to the other side of each soundboard, where are situated the electro pneumatic levers, which open the air valves below the pipes. As a primary part of these levers tiny magnets are provided, which have their magnetic circuit almost complete, and which seem to require but the faintest impulse to energize them. The

ORGAN AT ST. JOHN'S CHURCH, BIRKENHEAD—continued.

office of these magnets is to move little diaphragms or armatures, each weighing but one sixtieth part of an ounce. These armatures hardly move one hundredth part of an inch, and yet they instantaneously control the speech of huge pipes many hundred thousand times their weight.

We will now describe the "stop switch," the utility of which can hardly be over estimated. In the centre of the row of stop keys is fitted a little ivory touch, which in its normal condition projects, say, half an inch forward. The lightest touch of the finger upon it throws it partly in. There it stays, but its movement has broken the electric circuit upon which the action of the stop keys and couplers depends. The player is now at liberty (whilst he is performing, if opportunity offers) to *prepare* the stops and couplers for his next movement in any way he pleases.

The organ in the meantime will remain as it was. At the moment the change is wanted he lightly touches the upper surface of the stop switch; it then springs out to its normal position, and the stops and couplers of the whole instrument are instantaneously operated.

Then we would call attention to the transposing switch, which (without moving the key-board) enables the performer to transpose into any key; the touch, which is lighter and far more prompt in repetition than the finest pianoforte; the swell pedal, which has the combined advantages of the balanced and self closing systems; the studs, "suitable bass" and "independent pedals" (marked S and I respectively), which are placed below each manual for the instantaneous and automatic control of the pedal stops and couplers. These are some of the conveniences at the command of the organist which we have not space to fully describe.

Mr. Hope-Jones's claim as to the absolute reliability of his electric action seems to be principally based upon the very small amount of work which he gives the electricity to do. We were also shown a single dry cell, about the size of a two pound marmalade jar, capable of working a four manual organ for six months.

ORGAN AT ST. JOHN'S CHURCH, BIRKENHEAD---continued.

The original organ at St. John's was built by Jackson some forty years ago. The present reconstruction has been partly carried out by Mr. E. Franklyn Lloyd, of Liverpool; the action and design being by Mr. Hope-Jones.

We now give the specification.

PEDAL.

		<i>feet.</i>		<i>stop keys.</i>	
1	Great Quint ..	10 2.3	...	Quint	} White.
2	Open Diapason ...	16	...	Open	
3	Bourdon ...	16	...	Bourd.	
4	Violone ...	16	...	Viol.	
5	Principal ...	8	...	Prin.	} Red.
6	Ophicleide ...	16	...	Ophi.	
7	Choir ...	8	...	Choir	} Black.
8	Great ...	8	...	Great	
9	Swell ...	8	...	Sw. 8	
10	Swell Super ...	4	...	Sw. 4	
11	Swell Quint...	10 2.3	...	Sw. 10 $\frac{2}{3}$	

GREAT.

12	Contra Gamba ...	16	...	Cont.	} White.
13	Open Diap., large ...	8	...	Op. 1	
14	Open Diap., small ...	8	...	Op. 2	
15	Clarabel ...	8	...	Clar.	
16	Dulciana ...	8	...	Dulc.	
17	Principal ...	4	...	Prin.	
18	Flute ...	4	...	Flute	
19	Twelfth ...	2 2.3	...	12th	} Red.
20	Fifteenth ...	2	...	15th	
21	Mixture ...	3 rks.	...	Mixt.	
22	Tuba Mirabilis ...	8	...	Tuba	
23	Harmonic Clarion ...	4	...	Clar.	} Black.
24	Super Octave ..	4	...	8ve.	
25	Choir ...	8	...	Choir	} Black.
26	Swell Sub. ...	16	...	Sw. 16	
27	Swell Unison ...	8	...	Sw. 8	
28	Swell Super... ..	4	...	Sw. 4	
29	Swell Quint ..	10 2.3	...	Sw. 10 $\frac{2}{3}$	

Special stop switch in space between great organ and swell organ.

ORGAN AT ST. JOHN'S CHURCH, BIRKENHEAD—continued.

SWELL.

	<i>feet</i>	<i>stop keys.</i>	
30 Vox Angelica (T. C) ...	8 ...	Vox	Green.
31 Bourdon ...	16 ...	Bourd.	} White.
32 Open Diapason ...	8 ...	Open	
33 Stop Diapason ..	8 ...	Stopd.	
34 Salicional ...	8 ...	Salc.	
35 Principal ...	4 ...	Prin.	
36 Piccolo ...	2 ...	Picc.	} Red.
37 Mixture ...	3 rks. ...	Mixt.	
38 Oboe and Bassoon ...	8 ...	Oboe.	
39 Cornopean ...	8 ...	Corn.	} Black.
40 Clarion ...	4 ...	Clar.	
41 Sub-Octave ..	16 ...	8ve.	} Green.
42 Super-Octave ...	4 ...	8ve.	
43 Swell Shutters ...	...	Box	

CHOIR.

44 Gamba ...	8 ...	Gamba	} White.
45 Dulciana ..	8 ...	Dulc.	
46 Lieblich Gedacht...	8 ...	Gedt.	
47 Harmonic Flute ...	4 ..	Flute	} Red.
48 Corno di Bassetto	8 ...	Corno.	
49 Super-Octave ...	4 ...	8ve.	} Black.
50 Swell Sub. ...	16 ...	Sw. 16	
51 Swell Unison ...	8 ...	Sw. 8	
52 Swell Super ...	4 ...	Sw. 4	
53 Swell Quint ...	10 2.3 ...	Sw. 10 $\frac{2}{3}$	

COMPOSITION PISTONS.

Swell.	{ pp. ...	Vox Angelica.
	{ p. ...	Diapasons.
	{ mf. ...	Full to Fifteenth, with two reeds.
	{ f. ...	Full, with Octave Couplers.
Great.	{ p. ...	Clarabel and Dulciana.
	{ mp. ...	Small Diapasons and Flute.
	{ mf. ..	Full to Fifteenth.
	{ f. ...	Full to Mixture, with Swell to Great, Unison.
	{ ff. ...	Full to Mixture, with all Couplers and open Swell Box.
Choir.	{ fff. ...	Do., do., do., with Tuba mirabilis and Clarion.
	{ p. ...	Dulciana.
	{ mf. ...	Full to Harmonic Flute.
	{ f. ...	Full, and Swell to Choir Unison Coupler
	{ ff. ...	Full and all Couplers.

ORGAN AT ST. JOHN'S CHURCH, BIRKENHEAD—continued.

Two pedals are arranged, one within the other, in such a manner that a crescendo or diminuendo of the stops may be obtained whilst both hands are engaged upon the manuals.

There are two sforzando pedals, which may be depressed with the foot, but which spring upwards again as soon as the pressure is removed. One of these brings on the heavy reeds (the tuba, clarion, and ophicleide, which are on 10in. pressure), and the other draws the full swell, and the couplers, which add this organ to the great and to the choir, and opens the swell box.

The swell pedal is a self closing one, but can be left in any position. The box may be opened by means of the forte composition pistons or by a special stop key provided for the purpose. The stop key is however thrown out of action the instant that the foot is applied to the swell pedal.

The wind is supplied at two pressures, ten inches, and three inches, by a one horse Otto gas engine, which drives a cast iron air compressor in addition to a set of ordinary feeders. The speed of the engine and the valves of the compressor are governed automatically by electricity in accordance with the amount of wind required.

By means of a later form of stop key *any* stop may be drawn on *any* manual, and the need of couplers dispensed with.

ST. MARY ABBOTTS, KENSINGTON.

Description of the Organ in the Parish Church of St. Mary Abbots, Kensington, built by MESSRS. WILLIAM HILL AND SON, York Road Organ Works, Islington, N., and fitted throughout with their Electro-Pneumatic Action.

This instrument, originally built by Messrs. W. Hill and Son, has now (1892) been completely reconstructed and enlarged. Owing to difficulties of site it has been necessary to provide a console for the organist entirely detached from the organ, and although the distance between the two is in this case small, yet the console could be removed to any other position in the Church should this be required, which would merely involve the lengthening of the connecting cable.

ST. MARY ABBOTTS, KENSINGTON—continued.

The arrangement of the draw stops and keyboards does not materially differ from that adopted, by common usage, for the best modern pneumatic organs. The stops are disposed on either side, in splayed jambs, the small ivory knobs moving very lightly, either severally by the hand, or collectively by means of the combination buttons placed under the clavier. The stop knobs are, in all cases, shifted by the buttons, to the great advantage of the player.

The swell pedals are actuated by a pneumatic piston and tubular connexion.

The current is derived from a specially constructed "transformer," worked by the electric supply already in use for lighting purposes in the church. As but a feeble electric power is required for the action of the organ, this little apparatus evolves only a current such as is usually obtainable from a battery of a few cells, but is greatly superior to the latter as avoiding the risk of the running down of the battery, and the trouble of renewing the chemicals. In churches where no electric supply already exists, the little dynamo can readily be driven by the blowing engines, or, if these be absent, by a turbine.

The feeders of the organ are placed within the instrument, and have separate reservoirs. They are worked by two of Messrs. Hill's hydraulic engines.

GREAT, CC to G.		CHOIR, CC to G.	
	<i>ft.</i>		<i>ft.</i>
1 Double Diapason, wood and metal	16	13 Open Diapason, metal	8
2 Open Diapason, metal	8	14 Dulciana, metal	8
3 Open Diapason, metal	8	15 Gedeckt, wood	8
4 Stopped Diapason, wood ..	8	16 Gemshorn, metal	4
5 Hohl Flute, wood	8	17 Wald Flute, wood.....	4
6 Principal, metal	4	18 Piccolo, metal.....	2
7 Harmonic Flute, metal	4	19 Cor Anglais, metal	8
8 Twelfth, metal	3	SOLO, CC to G.	
9 Fifteenth, metal	2	20 Viola, metal	8
10 Mixture, 4 ranks, metal ...		21 Rohr Flute, wood and metal	8
11 Posaune, metal	8	22 Flauto Traverso, metal	4
12 Clarion, metal.....	4	(In a Swell Box.)	

ST. MARY ABBOTTS, KENSINGTON—continued.

SOLO—continued.

23	Orchestral Oboe, metal.....	ft. 8
24	Clarinet, metal	8
25	Vox Humana, metal	8
26	Tuba Mirabilis, metal	8

SWELL, CC to G.

27	Bourdon, wood	16
28	Open Diapason, metal	8
29	Salicional, metal	8
30	Voix Celeste, metal	8
31	Stopped Diapason, wood...	8
32	Principal, metal	4
33	Suabe Flute, wood	4
34	Fifteenth, metal.....	2
35	Mixture, 3 ranks, metal	
36	Contra Fagotto, metal ...	16
37	Horn, metal	8
38	Oboe, metal	8
39	Clarion, metal	4

PEDAL, CCCC to F.

40	Sub Bourdon, wood	32
41	Open Diapason, wood	16

PEDAL—continued.

42	Violone, wood	ft. 16
43	Bourdon, wood	16
44	Principal, metal	8
45	Bass Flute, wood	8
46	Trombone, wood	16

COUPLERS, &c.

47	Swell to Great.
48	Swell to Choir.
49	Swell Octave.
50	Solo to Great.
51	Great to Pedal.
52	Swell to Pedal.
53	Choir to Pedal.
54	Solo to Pedal.
	Four Electric Combination Buttons to Great.
	Four Electric Combination Buttons to Swell.
	Two Electric Buttons for Couplers. 50 and 51.

[*Per favour of Thos. Adams, Esq., F.R.C.O.*]

ORGAN IN THE CHURCH OF ST. ALBAN THE
MARTYR, BROOKE STREET, HOLBORN.

This organ is a divided one, is placed on either side of the choir in the north and south Chapels—and is played from the south side. The instrument is by Henry Willis and Sons, the well known firm of organ builders, and the action is their most recent form of tubular pneumatic. The wind is supplied at varying pressures by three of Mr. Vincent Willis's patent hydraulic engines. The organ has four fronts filled with spotted metal pipes. The draw-stop knobs are of solid ivory, and are placed at an angle of 45°.

ORGAN AT ST. ALBANS, HOLBORN—continued.

Four Manuals, CC to A; radiating and concave pedal board. Eight Composition Pedals, four to Swell and four to Great. Two Swell Pedals, one to Swell Organ and one to Solo. Three pneumatic pistons controlling the Swell to Great, Solo to Great, Great to Pedal. The manual keys are of the very best description, and the entire organ is said to be one of the finest examples of what a church organ should be.

The organ was opened on the Eve of St. Alban's day, 1895.

GREAT.

	<i>ft.</i>
1 Double Diapason	16
2 Open Diapason, No. 1	8
3 Open Diapason, No. 2	8
4 Clarabel Flute.....	8
5 Flute Harmonique.....	4
6 Principal	4
7 Twelfth	3
8 Fifteenth.....	2
9 Mixture, 3 ranks	
10 Double Trumpet	16
11 Trumpet	8
12 Clarion.....	4

SWELL.

13 Lieblich Bourdon	16
14 Geigen Principal	8
15 Lieblich Gedact.....	8
16 Salicional	8
17 Vox Angelica T.C.....	8
18 Gemshorn	4
19 Flageolet.....	2
20 Mixture, 3 ranks	
21 Contra Posaune	16
22 Cornopean	8
23 Hautboy	8
24 Vox Humana	8
25 Clarion.....	4

CHOIR.

26 Lieblich Gedact	8
27 Dulciana	8
28 Hohl Flöte	8

CHOIR—continued.

	<i>ft.</i>
29 Viola da Gamba	8
30 Lieblich Flöte	4
31 Concert Flute	4
32 Piccolo.....	2
33 Corno-di-Bassetto	8

SOLO.

34 Hohl Flute	8
35 Wald Flute.....	4
36 Tuba	8
37 Orchestral Oboe.....	8
38 Clarinet	8

PEDAL.

39 Contra Bourdon.....	32
40 Open Diapason	16
41 Violone	16
42 Bourdon	16
43 Octave	8
44 Violoncello	8
45 Mixture, 3 ranks	
46 Ophicleide	16

COUPLERS.

47 Swell to Great.	
48 Swell to Choir.	
49 Solo to Great.	
50 Great to Pedals.	
51 Swell to Pedals.	
52 Choir to Pedals.	
53 Solo to Pedals.	
54 Tremulant to Swell by Drawstop.	

This specification was drawn by Thomas Adams, 'Esq., F.R.C.O., the organist and director of the choir. Cost £2850. Manual keys solid ivory without joint.

ORGAN IN HOLY TRINITY CHURCH, SLOANE STREET, UPPER CHELSEA,

By Messrs. J. W. Walker & Sons, of 27, Francis Street, Tottenham Court Road, London.

This instrument, which stands in a spacious chamber forming the end of the north aisle, has two 16ft. speaking fronts, facing south and west. The instrument is specially rich in Diapason tone, there being four 8ft. Open Diapasons on the Great, two on the Swell, and one on the Choir. The wind, which is distributed at four different pressures, is supplied by powerful feeders placed in a basement immediately under the Organ. These feeders are worked by three hydraulic engines and an electro-motor, of which a full description is appended. The pneumatic lever is applied to the Great and Swell Organs, and Couplers in connection with them. The Solo Organ and Pedal Organ are played by means of an improved tubular pneumatic action. The drawstop action is also pneumatic.

In consequence of the fact that sufficient space has been allowed by the Architect, the Organ Builders have been able to keep the Great, Swell, Solo and Choir Organs all on one level, whereby an even temperature has been secured.

The contents of the organ, which may fairly rank as one of the finest in London, are as follows.

GREAT. Compass CC to A, in alto, 58 notes.

	<i>ft.</i>	<i>pipes</i>
1 Double Open Diapason, metal ...	16	58
2 Open Diapason, large	8	58
3 Open Diapason, medium	8	58
4 Open Diapason, small	8	58
5 Salicional (small scaled Open Diapason)	8	58

GREAT—continued.

	<i>ft.</i>	<i>pipes</i>
6 Stopped Diapason Bass, Wald		
Flute Treble ...	8 tone	58
7 Principal	4	58
8 Harmonic Flute...	4	58
9 Twelfth	2½	58
10 Fifteenth	2	58
11 Mixture ... 3 ranks		174
12 Trumpet	8	58
13 Double Trumpet	16	58
14 Clarion Mixture, 3 ranks		174

ORGAN AT HOLY TRINITY CHURCH, SLOANE
STREET—continued.

CHOIR. Compass CC to A,
in alto, 58 notes.

	<i>ft.</i>	<i>pipes</i>
15 Open Diapason ...	8	58
16 Gamba	8	58
17 Dulciana	8	58
18 Lieblich Gedact ..	8 tone	58
19 Gemshorn	4	58
20 Flute	4	58
21 Harmonic Gemshorn	2	58

SWELL. Compass CC to A,
in alto, 58 notes.

22 Double Diapason	16 tone	58
23 Open Diapason ...	8	58
24 Horn Diapason ...	8	58
25 Stopped Diapason	8 tone	58
26 Echo Gamba ...	8	58
27 Vox Angelica.....	8	46
28 Principal.....	4	58
29 Flute	4	58
30 Fifteenth.....	2	58
31 Mixture ... 4 ranks		232
32 Contra Fagotto ...	16	58
33 Horn	8	58
34 Hautboy	8	58
35 Clarion Mixture, 3 ranks		174

SOLO. Compass CC to A,
in alto, 58 notes.

36 Harmonic Flute...	8	58
37 Dulciana Flute ...	8	58
38 Lieblich Flute ...	4	58
39 Harmonic Piccolo	2	58
40 Vox Humana	8	58
41 Orchestral Oboe	8	58
42 Clarionet	8	58
43 Tuba	8	58

PEDAL. CCC to F, 30 notes
(soundboards and pipes carried
up an additional Octave to com-
plete Super-Octave Coupler).

	<i>ft.</i>	<i>pipes</i>
44 Double Open Dia- pason, wood ...	32	42
45 Open Diapason, wood	16	42
46 Open Diapason, metal	16	42
47 Bourdon	16 tone	42
48 Violoncello.....	8	42
49 Trombone	16	42

COUPLERS, &c.

50 Swell to Great.
51 Swell to Choir.
52 Solo to Great.
53 Great to Pedal.
54 Solo to Pedal.
55 Swell to Pedal.
56 Choir to Pedal.
57 Super-Octave to Swell.
58 Sub-Octave to Swell.
59 Super-Octave to Pedal.
60 Tremulant to Swell.
61 Tremulant to Solo.

Five Composition Pedals to Great,
also Controlling Pedal Organ
Stops.

Four Composition Pedals to Swell.

Five Pneumatic Pistons to Great.

Four " " Swell.

By means of a stop-handle, the
Pneumatic Pistons can be con-
nected with the Composition
Pedals.

ORGAN AT HOLY TRINITY, SLOANE STREET—continued.

Description of Electric Blowing Apparatus.

The hydraulic blowing apparatus originally provided for this Organ was found to be at times useless on account of the water pressure in the mains failing, and as at such times the instrument was rendered inoperative, it was decided to instal a supplementary electrical blowing apparatus, worked from the mains of the Chelsea Electricity Supply Company. This has been carried out by Messrs. Easton & Anderson, Electrical and General Engineers, of 3, Whitehall Place, S.W., and Erith Iron Works, Kent; and may be described as follows:—

It should be first stated that the apparatus was not intended to supply the complete full Organ, though, as a matter of fact, it very nearly will do so; and, as it was only intended as a stand-by, in order to simplify and cheapen it, all the wind is pumped at the highest pressure and afterwards reduced in the reservoirs to the other pressures in use on the organ. It, therefore, does not pretend to be the most economical arrangement that could be devised. Space was limited, and the arrangement had to be designed to suit circumstances, and so it could be improved in several respects were conditions suitable.

The apparatus consists of three cast-iron blowing cylinders, 18½ in. diam. × 18-in. stroke, arranged horizontally, but one on top of the other in a wooden framework, containing the valve boxes and wind trunk leading to the first regulating reservoir. The pistons of the cylinders are connected by suitable connecting rods, etc., to a three-throw wrought-iron vertical crankshaft, turning in bearings fixed to the other end of the frame, and driven at the bottom by worm gearing (in a cast-iron case,) making about 55 revolutions per minute.

The motor is of the "Whitehall" type, capable of giving out about four horse power with ease, and it drives the worm through the medium of a magnetic clutch, consisting of a short wrought-iron cylinder keyed to the spindle

ORGAN AT HOLY TRINITY, SLOANE STREET—continued.

with a deep concentric groove turned on its face, in which a coil of fine insulated wire is wound, the ends being brought out through holes in the back to two brass insulated contact rings on which a pair of brushes press, conveying the current to the coil. A similar arrangement is fitted to the worm shaft, and on switching the current on to these two cylinders they attract one another, causing sufficient friction between the faces to enable the motor to drive the worm. When the current is cut off, the clutches cease to attract one another with sufficient force to drive, and then a small spring between them comes into play, separating the faces so that they do not rub together and heat when the motor is running light.

It should be explained that the arrangement described was arrived at after some experimenting, and answered well, though in future cases, with experience now gained, probably one clutch and coil acting on a plain driving plate could be satisfactorily designed to do the work. The clutch is operated by a sliding contact on the first regulating reservoir, so arranged that when it is empty the clutch is active and the motor drives the pumps. When nearly full, contact is broken and the clutch leaves go, stopping the pumps, but allowing the motor to run on light, absorbing very little current. As the wind is used the reservoir sinks, and when nearly empty, contact is again established, and the pumps work once more. The magnetic friction clutch allows a little slip at starting, and prevents any jar from coming on the reservoirs.

The current is turned on to the motor by the Organist through the medium of an automatic device. At his right hand side are two stop knobs, one marked "Hydraulic," the other "Electric." To turn on the water he draws the former out. If the water fails to pump, he replaces it and draws the electric knob. This completes a circuit through a small electro magnet, wound with fine wire and taking an infinitesimal current to energize it, which attracts an armature on a counterpoised lever, making a contact from

ORGAN AT HOLY TRINITY, SLOANE STREET—continued.

the supply main through a series coil wound outside the shunt exciting coil on the motor field magnets, through the motor armature and back to the return main. The motor has now commenced to run, and as soon as it has attained a given speed, the back E. M. F. will have risen sufficiently to enable another small electro magnet to attract an armature on a lever with an adjustable counterpoise, and in so doing make one contact, and break another; which has the effect of cutting out the series coil on the magnets of the motor, and so permitting it to get away at full speed, the shunt coil on the magnets now supplying all the magnetising energy. The series coil thus acts as a starting resistance, and helps the motor to start under full load. For stopping—when the stop knob is pushed in, the first described small magnet loses its power and the counterpoise, on its armature lever, breaks the main circuit, and consequently stops the motor.

The automatic contrivances are placed in a mahogany case on an enamelled slate base in the stoke hole, together with two of Prentice's patent cut-outs, which open the circuit if an undue load comes on the motor from any cause, and so prevent accidents.

The apparatus works very satisfactorily, and is generally used for the morning services on Sundays.

[*From "Musical Opinion, May, 1894."*]

SOUTHPORT.

The new electric organ built by Messrs. W. Hill & Son for the Wesleyan Church, Mornington Road, was used for the first time on Easter Sunday last by Mr. John J. Ward, the hon. organist. Mr. J. Kendrick Pyne and Mr. C. W. Perkins have given recitals during the past month. The instrument is placed in the west gallery and divided, the great and choir being on the south, and the swell, solo,

SOUTHPORT ORGAN—continued.

and echo on the north side. The pedal organ runs alongside the south wall; the bourdon and trombone are on the west (the trebles being brought below the large window), and the violone and violoncello are on the north. The great is on a divided sound-board, over which is placed the choir, the reeds and lieblich flute being in a separate swell box. The whole of the echo is in a third swell box, placed as near the roof as practicable (60ft. high), the echo cornet being enclosed in a further internal box. The tuba mirabilis stands above the main swell, and the mouths of the tubes are mitred forward. The case, over 60ft. in length, contains the basses of the 16ft. metal open on the great, the two great opens and the choir diapason, also the violone on the pedal,—a total of one hundred and forty-seven pipes, all of which are silver bronzed. The console is fixed in the front of the orchestra (arranged for sixty voices). The hydraulic starter and Bailey's pressure gauge are on the right, the Woodhouse & Rawson electric switch and galvanometer on the left; the whole being enclosed by four plate glass doors. The action is electric throughout, and the length of cable from console to sound-board over 100ft.; the touch—however many couplers are drawn—being as light and crisp as a grand piano. The current is generated by a motor running a dynamo at eight hundred revolutions to the minute, and supplied to the organ through accumulators with a storage capacity of a hundred and thirty hours. The stops are as follows:—

GREAT.			SWELL.		
		<i>ft.</i>			<i>ft.</i>
1 Double Open Diapason	..	16	12 Bourdon	..	16
2 Open Diapason, large		8	13 Open Diapason	..	8
3 Open Diapason, small	..	8	14 Hohl Flöte	..	8
4 Viola	..	8	15 Æoline	..	8
5 Hohl Flöte	..	8	16 Vox Angelica	..	8
6 Principal	..	4	17 Principal	..	4
7 Harmonic Flute	..	4	18 Suabe Flöte	..	4
8 Octave Quinte	..	2½	19 Harmonic Flute	..	2
9 Fifteenth	..	2	20 Mixture	3 ranks	
10 Mixture	3 ranks		21 Contra Fagotto	..	16
11 Posaune	..	8	22 Horn	..	8

SOUTHPORT ORGAN—continued.

SWELL—continued.

23 Oboe	ft. 8
24 Clarion	4
25 Tremulant.	

CHOIR.

26 Violin Diapason ..	8
27 Dulciana	8
28 Gedacht	8
29 Lieblich Flöte ..	4
30 Flautina	2
31 Clarionet	8
32 Orchestral Oboe..	8
(Lieblich, Clarionet, and Orchestral Oboe in a separate box.)	

SOLO and ECHO.

33 Viole d' Amour ..	8
34 Echo Cornet ..	5 ranks
35 Cor Anglais	8
36 Vox Humana	8
37 Tuba Mirabilis (10in.)	8
38 Tremulant.	
(First Four in separate Swell.)	

PEDAL.

39 Open Diapason ..	16
40 Bourdon	16
41 Violone	16
42 Violoncello	8
43 Trombone	16

COUPLERS.

44 Swell to Great.
45 Swell Octave.
46 Swell Sub-octave.
47 Swell to Choir.
48 Solo to Great.
49 Solo Octave.
50 Great to Pedal.
51 Swell to Pedal.
52 Choir to Pedal.
53 Solo to Pedal.

COMBINATION PISTONS.

Four to Great.
Four to Swell.
Two to Choir.

COMBINATION PEDALS.

Four to Great and Pedal.
Two to Pedal.

COMMUTATION PEDALS.

Swell to Great.
Great to Pedal.
Solo to Great.
Solo to Pedal.
Swell Tremulant Pedal.
Echo Tremulant Pedal.
General Swell Pedal.
Choir Swell Pedal.
Echo Swell Pedal.
Manuals—CC to C.
Pedal—CCC to F.

The hydraulic engines, horizontal feeders, and regulating reservoirs are erected in an insulated chamber, 36ft. long, in the basement, and the wind is carried through the vestibule in zinc trunks to six reservoirs in the organ, which supply the various pressures required, from three to ten inches.

ORGAN AT ST. MATTHEW'S CHURCH,
NORTHAMPTON,

By Messrs. J. W. Walker & Sons, London.

The tubular work throughout embodies the latest improvements, ensuring the utmost rapidity of attack and repetition, and securing an absolutely uniform touch throughout the organ whether the manuals are coupled or used singly.

The drawstop action is electro pneumatic, as is also the combination piston work.

The pistons are so designed that the combinations of stops on each piston can be easily altered without more difficulty than the movement of a switch. Arrangements have been made whereby the necessary means of alteration for one piston at least to both Swell and Great, are within convenient reach of the player, so that at the commencement of a piece requiring a rapid change of stops to any special or fancy combination, this "selective" piston can be arranged by the player without leaving his position at the keys. The stops when acted upon by the pistons are thrown out in the ordinary manner.

The instrument throughout is constructed in the most substantial manner, and occupies a fine organ chamber about 22-ft. square and 40-ft. high. Two tiers of arches secure ample egress for the sound.

The electric blowing gear is also of especial interest. It has been expressly designed for this instrument and patented by Messrs. Easton and Anderson, Limited, Engineers, of London and Erith. The special object to be arrived at was a suitable mechanism for driving the blowing apparatus by means of an electric motor, which should at the same time be very steady in working and quite silent, as it was to be situated directly under the organ and therefore virtually in the Church.

There are two sets of gear employed, each complete in itself and independent of the other, one for supplying high pressure wind and the other low pressure. Each has four square feeders working vertically about five feet from the

ORGAN AT ST. MATTHEW'S, NORTHAMPTON—continued.

ground, attached to the underside of the regulating reservoirs, and below them a rocking framework of iron, carried by a ball joint formed in the centre of a cast iron frame, bolted to the floor of the chamber. An arm extends under each feeder with a recess at the end in which a pointed iron rod attached to the centre of the bottom board of the feeder rests. From the centre of this frame an iron spindle is carried up and terminates in a crank bearing formed in a horizontal worm wheel, so that when the latter is rotated the top of the spindle describes a circle, the effect of which is to cause the four arms projecting under the feeders to describe up and down movements and so work the feeders.

Each follows the other in an even succession, so that a very steady blast of wind is delivered into the reservoir, and there are no reversals of pressure on the crank pin, &c., to cause a knock.

The worm gear is carried by a cast iron casing fixed to the cast iron frame bolted to the floor. The electric motor is placed on a pedestal in a convenient position for actuating the worm. The machinery can be started and stopped by the organist from the keyboard, and when once started, is by suitable mechanism made self-regulating, according to the amount of wind required.

The current for blowing is derived from the same generating plant as supplies the electric light of the Church, Messrs. Easton and Anderson, who have carried out all the electrical work, having provided sufficient power and accumulators for the purpose.

GREAT.

	<i>ft.</i>	<i>pipes</i>
1 Double Open Diapason	16	61
2 Open Diapason ..	8	61
3 Open Diapason ..	8	61
4 Open Diapason ..	8	61
5 Wald Flute	8	61
6 Wald Flute	4	61

GREAT—continued.

	<i>ft.</i>	<i>pipes</i>
7 Principal	4	61
8 Twelfth	2½	61
9 Fifteenth	2	61
10 Mixture 8 ranks		183
11 Double Trumpet	16	61
12 Trumpet	8	61
13 Clarion	4	61

ORGAN AT ST. MATTHEW'S, NORTHAMPTON—continued.

CHOIR.

	<i>ft.</i>	<i>pipes</i>
14 Lieblich Bourdon	16	61
15 Gamba	8	61
16 Dulciana	8	61
17 Lieblich Gedact ..	8	61
18 Lieblich Flute ..	4	61
19 Dulciana Principal	4	61
20 Harmonic Gemshorn	2	61

SWELL.

21 Contra Gamba (closed bass) ..	16	61
22 Open Diapason ..	8	61
23 Violin Diapason ..	8	61
24 Stopped Diapason	8	61
25 Echo Gamba	8	61
26 Vox Angelica (Tenor C)	8	49
27 Principal	4	61
28 Flute	4	61
29 Fifteenth	2	61
30 Mixture 3 ranks	183	61
31 Contra Fagotto ..	16	61
32 Horn	8	61
33 Oboe	8	61
34 Vox Humana	8	61
35 Clarion	4	61
36 Tremulant.		

SOLO.

37 Harmonic Flute ..	8	61
38 Harmonic Flute ..	4	61
39 Harmonic Piccolo	2	61
40 Orchestral Oboe ..	8	61
41 Clarionet	8	61
42 Tuba	8	61
43 Tremulant.		

PEDAL.

	<i>ft.</i>	<i>pipes</i>
44 Double Open Dia- pason	32	12
45 Open Diapason ..	16	30
46 Violone	16	30
47 Bourdon	16	30
48 Principal	8	30
49 Flute	8	30
50 Trombone	16	30

COUPLERS.

51 Great to Pedal.
52 Swell to Pedal.
53 Choir to Pedal.
54 Solo to Pedal.
55 Swell to Great.
56 Swell to Choir.
57 Swell Sub-octave.
58 Swell Super-octave.
59 Solo to Great.
60 Choir to Great, unison.
61 Pedal Organ to Great Pistons.
Compass of Manuals, CC to C, 61 notes.
Compass of Pedals, CCC to F, 30 notes.
Five Combination Pistons to Great Organ.
Five Combination Pistons to Swell Organ.
Four Combination Pistons to Solo Organ.
Four Composition Pedals to Pedal Organ.
Four Composition Pedals to Swell Organ.
Tubular pneumatic action to Manuals and Pedals.

[From "*Musical Opinion.*"]

ORGAN IN CANTERBURY CATHEDRAL.

The present organ is one of Mr. Willis's masterpieces. No doubt it may owe something of its beauty of tone to the acoustic properties of the building. The organ, which replaced Green's old one, is situated in three bays of the south triforium. The pipes are symmetrically arranged without any attempt at a case. The action is entirely electrical, and is a perfect success. The console is elevated about fifteen feet above the floor of the south choir aisle, so that the organist is just seen from the choir, and can himself see the choir by mirrors. (Canterbury has not canopied stalls, like most cathedrals.)

GREAT.

1 Double Open Diapason ...	16 ft.
2 Large Open Diapason	8
3 Small Open Diapason	8
4 Stopped Diapason	8
5 Clarabel Flute	8
6 Quinte	5½
7 Principal	4
8 Harmonic Flute	4
9 Twelfth	2½
10 Fifteenth	2
11 Piccolo	2
12 Mixture	4 ranks
13 Double Trumpet	16
14 Cornopean	8
15 Clarion	4

SOLO.

16 Flute Harmonique	8
17 Concert Flute	4
18 Orchestral Oboe	8
19 Corno di Bassetto	8
20 Tuba	8
21 Clarion	4

SWELL.

22 Double Open Diapason ...	16 ft.
23 Open Diapason	8
24 Lieblich Gedackt	8
25 Salicional	8
26 Vox Angelica	8
27 Octave	4
28 Flageolet	2
29 Mixture	3 ranks
30 Contra Fagotto	16
31 Trumpet	8
32 Hautboy	8
33 Vox Humana	8
34 Clarion	4
35 Tremulant	

CHOIR.

36 Lieblich Gedackt	16
37 Open Diapason	8
38 Lieblich Gedackt	8
39 Viola di Gamba	8
40 Salicional	8
41 Gemshorn	4
42 Harmonic Flute	4
43 Flauto Traverso	4
44 Corno di Bassetto	8

ORGAN IN CANTERBURY CATHEDRAL—continued.

PEDAL.		COUPLERS—continued.	
45 Double Open Diapason ...	32	57 Swell Octave.	
46 Open Diapason, wood	16	58 Swell Sub-Octave.	
47 Open Diapason, metal	16	59 Solo to Great.	
48 Bourdon	16	60 Swell to Choir.	
49 Violone	16	61 Great to Pedal.	
50 Octave.....	8	62 Solo to Pedal.	
51 Flute	8	63 Swell to Pedal.	
52 Mixture.....	4 ranks	64 Choir to Pedal.	
53 Ophicleide	16	Manuals—CC to A.	
54 Clarion	8	Four Pistons to each Manual.	
COUPLERS.		Four Composition Pedals to Pedal Organ.	
55 Choir to Great.			
56 Swell to Great.			

[*By kind permission of William Reeves, Esq., Publisher of the "Musical Standard."*]

QUEEN'S HALL ORGAN, LANGHAM PLACE, W.,

By Messrs. Hill & Son, 1893.

The case was designed by the architect of the Hall, Mr. T. E. Knightly.

Every stop is of full compass; all the pipes, both in front, and, with very few exceptions, in the interior, are of the best spotted metal; the appointments of the console are also quite in keeping with the other portions in this respect; the keys, numerous stop-knobs, and combination pistons are of solid ivory of the best quality, and the arrangements of every detail are such as to afford the player the greatest ease, convenience, and comfort.

The action to manuals, pedals, stops, and pistons, is tubular pneumatic, constructed on a most improved principle, specially devised by the builders of this organ, and the speech is absolutely instantaneous.

The wind is supplied by separate blowing feeders placed in a chamber below, and driven by a gas engine. There

QUEEN'S HALL ORGAN—continued.

are two balanced swell pedals (unlike those in general use) placed over the centre of the pedal board, and side by side. The left hand one operates the Solo box, whilst the right controls the Swell. In appearance they somewhat resemble the blow pedals of a harmonium. There are also three pneumatic composition pedals acting on the pedal organ stops only.

There is a very effective tremulant to the Solo organ controlled by a stop-knob above the solo group. The organ has 4 manuals, compass CC to C, 61 notes, and a Pedal organ, CCCC to F, 30 notes; and contains 54 speaking stops, 9 couplers, and 23 accessories, which are arranged as follows:—

GREAT, CC to C.

	<i>ft.</i>
1 Double Open Diapason, metal	16
2 Open Diapason, metal	8
3 Open Diapason, metal	8
4 Spitz Flute, metal	8
5 Hohl Flute, wood	8
6 Principal, metal	4
7 Harmonic Flute, metal	4
8 Twelfth, metal	2½
9 Fifteenth, metal	2
10 Sharp Mixture, metal, 3 ranks	
11 Full Mixture, metal, 4 ranks	
12 Contra Posaune, metal	16
13 Posaune, metal	8
14 Clarion, metal	4

SWELL, CC to C.

15 Bourdon, wood	16
16 Open Diapason, metal	8
17 Gamba, metal	8
18 Salicional, metal	8
19 Voix Celeste, metal	8
20 Stopped Diapason, wood ..	8
21 Principal, metal	4
22 Salicet, metal	4
23 Fifteenth, metal	2

SWELL—continued.

	<i>ft.</i>
24 Mixture, metal 4 ranks	
25 Double Trumpet, metal ..	16
26 Horn, metal	8
27 Oboe, metal	8
28 Clarion, metal	4

CHOIR, CC to C.

29 Gedeckt, wood	16
30 Geigen Principal, metal ..	8
31 Dulciana, metal	8
32 Keraulophon, metal	8
33 Gedeckt, wood	8
34 Suabe Flute, wood	4
35 Flautina, metal	2
36 Contra Fagotto, metal	16
37 Cor Anglais, metal	8

SOLO, CC to C.

38 Viola, metal	8
39 Rohr Flute, metal	8
40 Harmonic Flute, metal	4
41 Piccolo, metal	2
42 Orchestral Oboe, metal ..	8
43 Clarionet, metal	8
44 Vox Humana, metal	8
45 Tuba Mirabilis, metal	8

(Nos. 42, 43, and 44 in a swell box.)

QUEEN'S HALL ORGAN—continued.

PEDAL, CCCC to F.

	<i>ft.</i>
46 Dble. Open Diapason, wood	32
47 Open Diapason, wood	16
48 Violone, metal	16
49 Bourdon, wood	16
50 Principal, metal	8
51 Violoncello, wood	8
52 Fifteenth, metal	4
53 Posaune, metal	16
54 Clarion, metal	8

COUPLERS, &c.

55 Swell to Great.
56 Solo to Great.
57 Swell to Choir.
58 Swell Octave.
59 Solo Octave.
60 Great to Pedals.
61 Swell to Pedals.

COUPLERS—continued.

62 Choir to Pedals.
63 Solo to Pedals.
64 Solo Tremulant.
Four Pneumatic Combination Pistons to Great.
Four Pneumatic Combination Pistons to Swell.
Three Pneumatic Combination Pistons to Choir.
Three Pneumatic Combination Pistons to Solo.
Three Pneumatic Combination Pedals to Pedal.
Three Pneumatic Pistons for Couplers.
Balanced Swell and Solo Pedals. The Great Organ Pistons act also, when required, upon the Pedal Organ.

[From "*Musical Opinion*."]]

ORGAN IN THE TEMPLE CHURCH, LONDON,
1897.

The famous old organ in the Temple Church has recently undergone complete restoration and renovation by Messrs. Norman Bros. & Beard. It may interest our readers to be reminded that this organ was originally built by Bernard Schmidt (better known in this country as Father Smith) in the year 1684, being enlarged at different times by Bishop, Robson, Schulze, and Forster & Andrews. The restoration just completed was planned by Dr. E. J. Hopkins (who has been organist of the church since 1843), and, apart from the alterations in the specification and general re-voicing, the mechanism has been brought thoroughly up to date. The new work comprises pneumatic action, combination pistons, hydraulic engines, &c. Following is a complete specification of the organ as it stands at the present time:—

ORGAN IN THE TEMPLE CHURCH, LONDON--continued.

GREAT.		SOLO.	
	<i>ft.</i>		<i>ft.</i>
1 Double Diapason	16	44 Flûte Harmonique.....	8
2 Open Diapason	8	45 Flûte Octaviant	4
3 Open Diapason	8	46 Piccolo Harmonique	2
4 Stopped Diapason	8	47 Clarionet	8
5 Hohl Flöte	8	48 Octave Oboe	4
6 Viola di Gamba	8	49 Tuba	8
7 Principal	4	PEDAL.	
8 Octave	4	50 Sub-Bass	32
9 Nason Flute	4	51 Major Bass.....	16
10 Twelfth	2 $\frac{3}{4}$	52 Open Diapason, wood	16
11 Fifteenth	2	53 Open Diapason, metal	16
12 Full Mixture, 4 ranks		54 Violone	16
13 Sharp Mixture, 5 ranks		55 Stopped Bass.....	16
14 Large Trumpet	8	56 Quinte	10 $\frac{1}{2}$
15 Small Trumpet	8	57 Principal	8
16 Clarion	4	58 Violoncello	8
SWELL.		59 Tenor Solo	4
17 Bourdon	16	60 Treble Solo	2
18 Open Diapason	8	61 Trombone	16
19 Violin	8	COUPLERS.	
20 Rohr Gedackt	8	62 Choir to Pedal.	
21 Salicional	8	63 Great to Pedal.	
22 Voix Celestes (CC)	8	64 Swell to Pedal.	
23 Principal	4	65 Solo to Pedal.	
24 Gambette	4	66 Pedal Octave.	
25 Rohr Flöte	4	67 Swell to Great.	
26 12th and 15th	2 $\frac{3}{4}$ & 2	68 Swell to Choir.	
27 Mixture, 4 ranks		69 Choir to Great Sub.	
28 Double Bassoon.....	16	70 Solo to Great.	
29 French Horn	8	PNEUMATIC PISTONS.	
30 Hautboy	8	Three to Choir.	
31 Vox Humana	8	Five to Great and Pedal.	
32 Clarion	4	Four to Swell.	
CHOIR.		Three to Solo.	
33 Lieblich Bourdon	16	Great to Pedal, on, off.	
34 Violin Diapason.....	8	COMPOSITION PEDALS.	
35 Lieblich Gedackt	8	One for Soft Pedal Organ.	
36 Spitz Flöte	8	One for Swell to Great.	
37 Dulciana	8	One for Swell to Pedal.	
38 Flauto Traverso	4	Manuals—CC to G.	
39 Gemshorn	4	Pedal—CCC to F.	
40 Violino	4	Tremulant by Pedal.	
41 Lieblich Flöte	4		
42 Mixture, 3 ranks			
43 Corno di Bassetto	8		

[From "*The Student*," Dec. 3rd, 1897, (*special number*), *per kind favour of Robt. Hope-Jones, Esq.*]

THE ORGAN IN THE M'EWAN HALL, EDINBURGH.

Among the many beautiful architectural and decorative features of the M'Ewan Hall, the organ does not perhaps take a very prominent place, yet it would not be right to say that it plays but a small part in the general scheme. Designed as it has been for the ear and not the eye, to be properly appreciated it must be heard rather than seen. It was not originally intended to make any provision for a musical instrument in the Hall, and it was not until the building was erected that the cleverness of the architect was called into play to find room for one of the largest organs in Scotland without disturbing the architectural scheme or encroaching upon the available space. In preference to building a special organ chamber, or depositing the whole structure in one solid unsightly mass on the floor, the instrument has been divided into seven different portions, and has been stowed away in various positions about the Hall in such a skilful manner that its introduction has in no way disfigured the original design.

The only part of the organ which is actually in the Hall, and is visible, is that occupying the centre of the back wall. This space has been utilised for the "choir" organ, and one "stop" from the solo, which are concealed by a handsome carved oak case, containing the pipes of the "pedal" dulciana. In a passage behind the platform, and underneath the gallery, is placed the "pedal" open diapason, on the other side of a column stands the light wind "great" organ, and at a distance of 20 feet in the opposite direction the heavy wind "great." On the landing of a staircase leading to the upper gallery are the 16-feet diaphones, and the "pedal" bourdon and flute. In a room above the principal staircase the "swell" and the greater part of the "solo" find a resting-place. The 32-feet diaphones have to make themselves heard through a small

M'EWAN HALL ORGAN, EDINBURGH—continued.

semi-circular opening near the roof, whilst lying down on the floor nearly 200 feet away from other parts of the instrument. In a cellar below the platform the bellows and blowing apparatus are to be found.

This difficulty of the disposal of so large an amount of pipework having been successfully surmounted, brought forward the question, "How is this scattered organ to be played by a single performer?"—a problem solved by the Hope-Jones Organ Company through the instrumentality of the nascent science of electricity. The whole of this widely dispersed instrument is connected together electrically, and operated and controlled by one man seated at a movable "console" or key-desk, which may be placed in any part of the Hall at the wish of the organist. A flexible cable about one inch in diameter, containing over 1,500 fine copper wires, joins the key-boards in this console to the multitudinous pipes in the organ, and through 200 feet of this cable are flashed lightning messages from the mind and fingers of the organist, whose commands are instantaneously answered by the voice of the pipes. It would be out of place on the present occasion to attempt a technical explanation in detail of the electro-pneumatic action, and indeed to make it intelligible without the use of sectional plans and drawings would be almost impossible. It may be interesting to learn, however, that the action of all the key-boards together requires no more electricity than is needed for the common household electric bells, and this current is supplied by a few dry cells. This may be more easily comprehended when it is understood that all the current is required to do is to energise a very small electro-magnet, which has to attract a minute armature (in the shape of a circular metal disc as light as a pin) away from the valve-seat on which it rests. This disc only moves one-sixty-fourth part of an inch, but in so doing it opens up a way of escape for compressed air, which immediately causes the sudden collapse of a small motor, and at the same moment pulls down the pallet and allows

M'EWAN HALL ORGAN—continued.

the wind to rush into the pipe, making it give out its note. Imagine this built on a very small scale, and you have the essential principle of the action, and can realise what a saving of space and expense is effected by the use of this electrical mechanism.

The console is an instrument resembling a large harmonium, and is made up of the four manual key-boards and the pedal-board, to control the various departments of the organ. The different registers are governed by small ivory tablets called stop-keys, which do the work of the old-fashioned draw-stops, and are placed in a row just below the music desk. They are pivoted in the centre, and can be operated in either direction, bringing the different stops either on or off by a touch of the finger, thus saving the unnecessary trouble of constantly looking to the right or left and removing the hands from the keys to pull out or push in draw-stop handles.

The player is also assisted in his selection of stops by a series of composition keys which appear on each key-board in the spaces between the black notes. By using these whilst playing, various useful combinations of stops, ranging from pianissimo to fortissimo, can be instantly drawn in each or every department without withdrawing the fingers from the keys. If touched in the centre, these composition keys, in addition to altering the selection of manual stops, automatically provide a suitable combination of stops and couplers on the pedal organ; whereas if touched on one side, they do not disturb the pedal department. All these combination movements affect the stop-keys themselves, so that the memory of the organist is not taxed. Another valuable adjunct to the console is the stop-switch. The next required combination of stops and couplers on the different key-boards can always be prepared in advance at the most convenient moment during the performance of a piece, the existing combination continuing in force until, by touching the stop-switch, the new one is brought on instantaneously. The first two combinations can be

M'EWAN HALL ORGAN—continued.

arranged before commencing to play. Two of these stop-switches are provided, one worked by hand, and the other by the foot.

Every key-board is provided with the "Double" or deeper touch, which enables the organist, by pressing more heavily on the notes, to give expression to individual parts, and also to produce crescendo and sforzando effects hitherto unattainable.

The touch of the keys, even when the whole of the organ is being used coupled together, is as light as that of any piano, since all that the keys are required to do is to touch the ends of the wires to make electrical contact. One of the many points in which this organ differs from any other is the unusual effectiveness of the swell; the extremely distant ethereal music, scarcely heard when the swell-box is closed, gradually giving place to louder and yet louder tones, until the full band seems to march into the very Hall from across the street. This is due in a great measure to the peculiarity of the swell shutters, which are operated by an electrical contrivance, not all at once but in due rotation, one shutter after another opening up just as quickly or as slowly as the swell-pedal is pressed down by the foot, the sound meanwhile increasing in volume and power as each succeeding shutter opens.

Undue prominence may perhaps have been given in this sketch to some of the novelties introduced into the mechanism of the organ. If this is so, it has been done under the impression that a description of the action would have a more widely spread interest than a catalogue of the numerous recent inventions in tone production which are utilised in this instrument. But to the mind of the organist and musician these improved methods of producing tone, for which more than twenty patents have lately been granted, are of greater importance than the electric action, and place the diaphonic organ on a different platform to any other instrument. Hitherto organ tone has been produced in two ways only, by means

M'EWAN HALL ORGAN—continued.

of "flue" pipes (magnified penny whistles) and "reeds" (having a vibrating metal tongue). The diaphone, as used in this organ, is neither "reed" nor "flue," but is a novel sound-producer consisting of a series of pneumatic valves actuated by a motor, and governed in periodicity by a resonator or pipe. A diaphone is like a reed pipe, in that the tone is produced by admitting a series of puffs of air into a resonator, but it differs from a reed-pipe in the following important particulars. The *frequency* of the puffs of air is governed solely by the period of the resonator, so that the diaphones will remain in tune with the flue-stops whatever the changes in temperature may be. The *form* of the puffs of air is absolutely under control, so that an almost infinite variety of tone qualities can be produced. The *volume* of the puffs of air can be increased without limit, so that the power of tone may be multiplied indefinitely. In addition to this, diaphones may, like the free reeds of the harmonium, be set over a variable pressure of wind without material alteration in pitch, so that expression can be obtained as in the harmonium. The various forms which these diaphones may take, and the different qualities of tone resulting, are numberless. Unlimited power, smooth depth of majestic foundation tone, promptness of speech, and variety of tonal effect, are among their most obvious advantages over the older methods of tone production. Any other form of pedal-pipes placed to such disadvantage as are the 32-feet diaphones in this organ would be practically inaudible in the Hall.

Another powerful tonal effect is produced by the Tuba Mirabilis, where each pipe is provided with two reed tongues synchronised pneumatically. In contrast to these trumpet-tones, we may turn with relief to some of the more delicately-voiced orchestral and solo stops, which are characterised by great imitative variety, and dainty delicacy of tone. Some of these pipes are made of polished brass, a quarter of an inch in diameter, and 8 feet in length,

M'EWAN HALL ORGAN—continued.

resembling stair rods, some from pure tin of unusual thickness, and some of special metal of great weight, every variety in material and shape having its own characteristic quality of tone-colour.

One is conscious of having touched but lightly upon only a few of many interesting features in the instrument ; but before leaving the subject, a reference to the blowing apparatus might be instructive. The organ is not only played electrically, but is blown by the same agency, and the wind supply is regulated by an automatic electric switch, in such a manner that the feeders or bellows are at work only when a demand arises, and always in exact proportion to the needs of the player. To watch the engine start off at full speed at the sound of the full organ, slow down in the piano passages, and stop at the end of the fugue or sonata, makes one think it is almost human, and is busy anticipating the wants of the organist.

Specification of the organ :—

PEDAL. Compass CCC to F, 30 Notes.	GREAT. Compass CC to C, 61 Notes.
Quint (from Great) <i>ft.</i> 32 (lowest octave acoustical.) Open Diapason 16 Double (from Great) 16 Dulciana 16 Flute (from Great) 8 Diaphone 32 Diaphone 16 Ophicleide 16 Solo to Pedals. Solo to Pedals (Super). Great to Pedals. Swell to Pedals. Choir to Pedals. Ten Composition keys (as below) for Pedal Stops and Couplers. One Adjustable Combination Key.	Contra Tibia Clausa <i>ft.</i> 16 Diapason Phonon 8 Horn Diapason 8 Tibia Plena 8 Open Diapason 8 Hohl Flute 8 Geigen Principal 4 Quintadena 4 Harmonic Flute 4 Harmonic Piccolo 2 Bombarde 16 Trumpet 8 Sub Octave (light wind). Super Octave (heavy wind). Solo to Great (Sub). Solo to Great (Unison) double touch. Solo to Great (Super). Swell to Great (Sub).

M'EWAN HALL ORGAN—continued.

GREAT—continued.

Swell to Great (Unison) double touch.
 Swell to Great (Super).
 Choir to Great (Sub).
 Choir to Great (Unison).
 Three Compound Composition keys for Great Stops and Pedal Stops and Couplers.
 Two Compound Composition keys for Great Couplers.
 Three Composition Pedals.
 One Adjustable Combination key.

SWELL. Compass CC to C, 61 Notes.

	<i>ft.</i>
Violes Celestes (double touch)	8
Contra Viola	16
Tibia Clausa	8
Horn Diapason	8
String Gamba	8
Quintadena	8
Quintaton	4
Gambette	4
Harmonic Flute	4
Harmonic Piccolo	2
Double English Horn	16
Cornocean	8
Oboe	8
Vox Humana	8
Clarion	4

Sub Octave.

Super Octave.

Solo to Swell (second touch).

Choir to Swell (second touch).

Tremulant (on light wind stops).

Swell Pedal.

Four Compound Composition keys for Swell Stops and Pedal Stops and Couplers.

Two Composition keys for Swell Couplers.

Three Composition Pedals.

One Adjustable Combination key.

CHOIR. Compass CC to C, 61 Notes.

	<i>ft.</i>
Viol d'Orchestre	8
Lieblich Gedact	8
Dulciana	8
Flauto Traverso	4
Corno de Bassetto	8
Cor Anglais (free)	8

Super Octave.

Swell to Choir (Sub).

Swell to Choir (Unison) double touch.

Swell to Choir (Super).

Three Compound Composition keys for Choir Stops and Pedal Stops and Couplers.

Two Compound Composition keys for Choir Couplers.

One Adjustable Combination key.

SOLO. Compass CC to C, 61 Notes.

In the Swell Box.

Rohr Flute	8
Tuba Sonora	8
Tuba Mirabilis (outside the box)	8
Kinura	8
Cor Anglais (beating)	8

Sub Octave.

Super Octave.

Three Combination keys for Solo Stops.

Two Composition keys for Solo Couplers.

GENERAL ACCESSORIES.

Stop-switch (key and pedal).

Sforzando Pedal bringing on Tuba Mirabilis, Ophicleide, and Solo to Great Coupler.

[From "*Musical Opinion.*"]

LEEDS PARISH CHURCH ORGAN.

The fine organ in this church was originally built by Snetzler, and re-built more than half a century since by Greenwood, a famous builder of the town, whose noted pedal open sub bass (32ft.) cannot be excelled. The organ was afterwards re-built by Messrs. Hill (of London) and Schultze; the former was responsible for the Swell organ and the whole of the action with the exception of the Echo organ, which was entirely the work of the latter. Schultze was also responsible for the Great and Choir organs and part of the Pedal organ. Again, in 1883, the organ was entirely re-built and enlarged by Mr. Abbott (now Abbott & Smith). The instrument contains the appended stops:—

PEDAL, CCCC to F (30 Notes).

Wind pressure, $3\frac{3}{4}$ in.
Flue Work.

	<i>ft.</i>	<i>pipes</i>
1 Sub Bass, open ...	32	30
2 Open Bass, open	16	30
3 Violone, open.....	16	30
4 Bourdon, closed...	16 tone	30
5 Flute Bass, closed	8 tone	30
6 Violoncello, open	8	30
7 Full Mixture, 4 rks. various... ..		120
(15, 19, 22, 26 to BB—12, 15, 19, 22 to F).		
Reeds.		
8 Contra Trombone, open	82	30
9 Trombone, open...	16	30
10 Clarion, open	8	30

GREAT, CC to G (56 Notes).

Wind pressure, $3\frac{3}{4}$ in.
Flue Work.

11 Sub Bourdon, Ten. C	32 tone	44
12 Double Open Dia- pason	16	56

GREAT—continued.

	<i>ft.</i>	<i>pipes</i> tone
13 Bourdon	16	56
14 Large Open Dia- pason	8	56
15 Small Open Dia- pason	8	56
16 Salicional	8	56
17 Pierced Gamba ...	8	56
18 Hohl Flöte, open	8	56
19 Gedact.....	8 tone	56
20 Quint, open	6	56
21 Octave	4	56
22 Harmonic Flute...	4	56
23 Nazard	2 $\frac{3}{4}$	56
24 Super Octave	2	56
25 Mixture, 3 ranks		168
26 Full Mixture, 5 ranks		280

Reeds.

27 Double Trumpet	16	56
28 Posaune	8	56
29 Tromba	8	56
30 Clarion	4	56
31 Tuba	8	56

The last stop is on a separate sound-board, with a wind pressure of 7 in.

LEEDS PARISH CHURCH ORGAN—continued.

SWELL, CC to G (56 Notes).

Wind pressure, 3in.

Flue Work.

	<i>ft.</i>	<i>pipes</i>
32 { Double Open Dia- pason (ten. C) Bourdon (lowest octave CC) ... }	16 tone	56
33 Open Diapason ...	8	56
34 Cone Gamba	8	56
35 { Dulciana (ten C) Violin e Voix	8	44
36 { cello céleste	8	56
37 Stopped Diapason	8 tone	56
38 Wald Flute, open	4	56
39 Octave	4	56
40 Octave Quint	2 $\frac{3}{4}$	56
41 Super Octave	2	56
42 Mixture, 5 ranks, various	280	

Reeds.

43 Contra Fagotto ...	16	56
44 Horn	8	56
45 Trumpet	8	56
46 Oboe	8	56
47 Vox Humana	8	56
48 Clarion.	4	56

The Dulciana and Violin e cello used in combination produce the Voix Célestes, the Dulciana being tuned slightly sharp.

A Tremulant is attached to this Organ.

CHOIR, CC to G (56 Notes).

Wind pressure, 2 $\frac{1}{2}$ in.

Flue Work.

49 Bourdon	16 tone	56
50 Geigen Principal	8	56
51 Salicional	8	56
52 Gedact	8 tone	56
53 Vox Angelica ...	8	56
54 Gemshorn	4	56
55 Gedact Flute	4 tone	56

Reeds.

56 Orchestral Oboe (tenor C)	8	44
57 Clarionet (tenor C)	8	44

CHOIR—continued.

	<i>ft.</i>	<i>pipes</i>
58 Corno-di-Bassetto (CC)	8	12

The three imitative stops (Orchestral Oboe, Clarionet, Corno-di-Bassetto) are placed in a separate swell box.

ECHO, CC to G (56 Notes).

Wind pressure, 1 $\frac{1}{2}$ in.

Flue Work.

59 Lieblich Bourdon	16 tone	56
60 Open Principal ...	8	56
61 Viol di Gamba ...	8	56
62 Dolce	8	56
63 Flauto Traverso (open)	8	56
64 Echo Oboe	8	56
65 Lieblich Gedact ...	8 tone	56
66 Lieblich Flute... ..	4 tone	56
67 Octave	4	56
68 Flauto Dolce	4	56
69 Flautina	2	56

COUPLERS.

Manual.

70 Swell to Great.
71 Swell to Choir.
72 Choir to Great.

Pedal.

73 Great to Pedal.
74 Swell to Pedal.
75 Choir to Pedal.

Composition Pedals.—Four to Great and Pedal Organs, and three to Swell Organ.

One foot pedal for Great to Pedal, and one for Swell to Great.

The pneumatic lever is applied to Swell, Great, and Pedal organs, and to manual couplers; also a pneumatic composition to draw the Tuba as a solo stop.

The organ is perfectly blown by two of Speight's hydraulic engines, which can be turned on or off at the keys at a moment's notice.

ORGAN IN ST. ANDREW'S HALL, GLASGOW,

By Messrs. Lewis & Co., London,

From the design and under the superintendence of the late
Mr. Henry Smart, and Mr. W. T. Best.

Four Manuals and Pedale, 78 Stops.

CHOIR, CC to C (61 Notes).

1	Lieblich Bourdon	<i>ft.</i> 16
2	Violin Diapason.....	8
3	Dulciana	8
4	Flauto-traverso	8
5	Lieblich-gedact	8
6	Lieblich-flöte	4
7	Gemshorn	4
8	Piccolo.....	2
9	Vox Humana } enclosed in	8
10	Clarionet } a Swell	8

FRONT GREAT, CC to C
(61 Notes).

11	Double Open Diapason ...	16
12	Open Diapason, large	8
13	Open Diapason, small	8
14	Rohr-flöte	8
15	Octave	4
16	Twelfth	2 $\frac{3}{4}$
17	Fifteenth	2
18	Sesquialtera—4 ranks	
19	Trumpet	8

BACK GREAT.

20	Bourdon	16
21	Viola	8
22	Hohl-flöte	8
23	Harmonic Flute	4
24	Octave Viola	4
25	Mixture—5 ranks	
26	Double Trumpet	16
27	Trombone	8
28	Clarion.....	4

SWELL, CC to C (61 notes).

29	Bourdon	<i>ft.</i> 16
30	Open Diapason	8
31	Spitz-flöte	8
32	Viol-de-Gambe	8
33	Voix-Célestes	8
34	Flauto-dolce	8
35	Octave	4
36	Suabe-flöte	4
37	Nazard.....	2 $\frac{3}{4}$
38	Fifteenth	2
39	Full Mixture—4 ranks	
40	Echo Dulciana Cornet, 6 rks.	
41	Contra Fagotto	16
42	Trumpet	8
43	Cornopean	8
44	Oboe	8
45	Clarion	4

SOLO, CC to C (61 notes),
enclosed in a Swell.

46	Tuba	8
47	Tromba	8
48	Harmonic Flute	8
49	Octave Flute	4
50	Cor Anglais	8
51	Orchestral Oboe.....	8
52	Orchestral Clarionet	8

PEDAL, CCC to G (32 notes).

53	Double Open Diapason.....	32
54	Open Diapason, wood	16
55	Open Diapason, metal	16
56	Violon Dulciana.....	16
57	Quint	10 $\frac{3}{4}$

ORGAN IN ST. ANDREW'S HALL, GLASGOW—continued.

PEDAL—continued.		COUPLERS—continued.	
	<i>ft.</i>		
58 Octave	8	68 Swell to Pedals.	
59 Violoncello	8	69 Solo to Pedals.	
60 Grave Mixture—2 ranks		70 Swell to Great, sub-octave.	
61 Trombone	16	71 Swell to Great, unison.	
62 Contra Fagotto	16	72 Swell to Great, super-octave.	
63 Trumpet	8	73 Choir to Great.	
64 Clarion.....	4	74 Swell to Choir.	
COUPLERS.		75 Solo to Great.	
65 Full Pedal Organ.		76 Great to Solo.	
66 Great to Pedals.		77 Solo, sub-octave, on its own	
67 Choir to Pedals.		clavier.	
		78 Solo, super-octave, on its own	
		clavier.	

Total Number of Sounding Stops.

Choir Organ, 10; Great Organ, 18; Swell Organ, 17; Solo Organ, 7;
Pedal Organ, 12; Total 64.

The Number of pipes contained in this organ is as follows :

Choir, 610; Great, 1,525; Swell, 1,525; Solo, 427; Pedal, 416;
Total, 4,503.

Thirteen Combination and other Pedals.

Three Combination Pedals for the Swell Organ; Four Combination Pedals for the Great and Pedal Organs; Ventil Pedal, admitting wind to the stops of the "Back Great Organ"; Swell "crescendo" Pedal; Solo "crescendo" Pedal; Choir "crescendo" Pedal; Tremulant to Choir; Tremulant to Swell.

Coupling Pedals.

Solo to Pedals, Great to Pedals, on the left; Solo to Great, Swell to Great, on the right.

An elaborate Pneumatic Apparatus extends throughout the instrument, and is applied to the whole of the valve-work, draw-stop action, and couplers.

The bellows are operated by three very powerful hydraulic engines by Messrs. Forrester of Liverpool.

[From "Musical News."]

ORGAN IN BANGOR CATHEDRAL.

Specification of the organ re-built by Messrs. William Hill & Son.

GREAT (17 Stops). CC to A, 58 Notes.		CHOIR (12 Stops). CC to A, 58 Notes.	
	<i>ft.</i>	<i>(All enclosed in a separate Swell-Box.)</i>	
1 Double Open Diapason, metal	16	32 Lieblich Gedact, wood	<i>ft.</i> 16
2 Bourdon, wood	16	33 Geigen Principal, metal ..	8
3 Large Open Diapason, metal	8	34 Stopped Diapason, wood ..	8
4 Small Open Diapason, metal	8	35 Dulciana, metal	8
5 Stopped Diapason, wood ..	8	36 Viola, metal	8
6 Clarabella, wood	8	37 Vox Angelica, (B flat,) metal	8
7 Spitz Flute, metal	8	38 Unda Maris, 2 ranks, metal	8
8 Viol di Gamba, metal	8	39 Röhr Flute, wood and metal	4
9 Harmonic Flute, metal	4	40 Suabe Flute, wood	4
10 Stopped Flute, wood	4	41 Gemshorn, metal	4
11 Principal, metal	4	42 Harmonic Piccolo, metal ..	2
12 Twelfth, metal	3	43 Clarionet, metal	8
13 Fifteenth, metal	2		
14 Mixture, 4 ranks, metal, various		SOLO (9 Stops). CC to A, 58 Notes.	
15 Contra Posaune, metal	16	<i>(Enclosed in a separate Swell-Box, except Tubas.)</i>	
16 Posaune, metal	8	44 Harmonic Flute, metal	8
17 Clarion, metal	4	45 Harmonic Flute, metal	4
		46 Viola d'orchestre, tin	8
SWELL (14 Stops). CC to A, 58 Notes.		47 Orchestral Oboe, tin	8
18 Bourdon, wood	16	48 Cor Anglais, metal	16
19 Open Diapason, metal	8	49 Vox Humana, metal	8
20 Violoncello, wood and metal	8	50 Musette, metal	8
21 Lieblich Gedact, wood	8	51 Contra Tuba, metal	16
22 Echo Violin, metal	8	52 Tuba Mirabilis, metal	8
23 Voix Celeste, (B flat,) metal	8		
24 Flauto Traverso, wood	4	PEDAL (12 Stops). CCC to F, 30 Notes.	
25 Principal, metal	4	53 Double Open Diapason, wood	32
26 Octavin, (harmonic,) metal	2	54 Open Diapason, wood	16
27 Mixture, 4 ranks, metal, various		55 Open Diapason, metal	16
28 Contra Fagotto, metal	16		
29 Cornopean, metal	8		
30 Oboe, metal	8		
31 Harmonic Clarion, metal ..	4		

ORGAN IN BANGOR CATHEDRAL—continued.

PEDAL—continued.

56 Violone, wood	<i>ft.</i> 16
57 Bourdon, wood	16
58 Quint, wood	12
59 Violoncello, wood	8
60 Bass Flute, wood	8
61 Fifteenth, metal	4
62 Contra Trombone, wood ..	32
63 Trombone, wood	16
64 Trumpet, metal	8

COUPLERS, &c.

65 Swell to Great (left and right).
66 Great to Pedal (left and right).
67 Solo to Great (left and right).
68 Choir to Great.
69 Swell to Choir.
70 Solo to Choir.
71 Swell to Pedal.
72 Choir to Pedal.
73 Solo to Pedal.
74 Swell Octave.
75 Swell Sub-Octave.
76 Solo Octave.

COUPLERS—continued.

77 Solo Sub-Octave.
78 Great Sub-Octave.
79 Pedal Octave.
80 Pedal to Great Pistons.
81 Pedal to Swell Pistons.
82 Pedal to Choir Pistons.
83 Swell Tremulant.
84 Solo Tremulant.

ACCESSORIES.

Four Combination Pistons to Great Organ.
Four Combination Pistons to Swell Organ.
Four Combination Pistons to Choir Organ.
Four Combination Pedals to Pedal Organ.
Three Poppet Pedals (on and off), Swell to Great, Great to Pedal, Solo to Great.
Three balanced Crescendo Pedals (Swell, Solo and Choir), not, however, placed in the centre of the Pedal Board.

[From "*The Organist and Choirmaster.*"]

ORGAN IN WORCESTER CATHEDRAL.

The great 32-feet organ built by Messrs. Wm. Hill & Son in 1875, and presented by Earl Dudley to Worcester Cathedral, has for some time been undergoing considerable alteration and reconstruction on the electric system by the Hope-Jones Organ Company, and was re-opened though not in a completed state.

The instrument is divided into three portions, and placed part against the south wall of the south transept and part on either side of the choir, the whole being controlled from

ORGAN IN WORCESTER CATHEDRAL—continued.

a small electric console placed inside the screen, just west of the choir stalls. The throwing back of the large organ case which used to block the fine Norman arch of the south transept, and the placing of a new organ case on the south side of the choir of the Cathedral, to match that existing on the north side, has greatly improved the appearance of the building. The new organ is fitted with all Mr. Hope-Jones' latest electrical improvements, together with pipes constructed on an entirely new plan invented by him.

The following is the new specification of the organ :—

GREAT (11 Stops).		SWELL (15 Stops).	
	<i>ft.</i>		<i>ft.</i>
1 Diapason Phonon	16	12 Contra Viola	16
2 Tibia Plena	8	13 Violes Célestes	8
3 Diapason Phonon	8	14 Tibia Clausa	8
4 Open Diapason	8	15 Horn Diapason	8
5 Hohlflöte	8	16 String Gamba	8
6 Viol d'Amour	8	17 Quintaton	8
7 Octave Diapason	4	18 Gambette	4
8 Quintadena	4	19 Harmonic Flute	4
9 Harmonic Piccolo	2	20 Harmonic Piccolo	2
10 Tuba Profunda	16	21 Double English Horn	16
11 Tuba	8	22 Cornopean	8
Sub Octave (light wind).		23 Oboe	8
Super Octave (heavy wind).		24 Cor Anglais (free)	8
Solo to Great (sub).		25 Vox Humana	8
Solo to Great (unison, double touch).		26 Clarion	4
Solo to Great (super).		Sub Octave.	
Swell to Great (sub).		Super Octave.	
Swell to Great (unison, double touch).		Tremulant (light wind stops).	
Swell to Great (super).		Solo to Swell (second touch).	
Choir to Great (sub).		Choir to Swell (second touch).	
Choir to Great (unison).		Swell Pedal.	
Five Compound Composition Keys for Great Stops and Pedal Stops and Couplers.		Five Compound Composition Keys for Swell Stops and Pedal Stops and Couplers.	
Two Compound Composition Keys for Great Couplers.		Two Compound Composition Keys for Swell Couplers.	
		One Combination Key, bringing Heavy Reeds only.	
		One Combination Key, bringing Strings only.	

ORGAN IN WORCESTER CATHEDRAL—continued.

CHOIR (10 Stops).

	<i>ft.</i>
27 Double Open Diapason ..	16
28 Open Diapason	8
29 Cone Lieblich Gedackt....	8
30 Viol d'Orchestre	8
31 Tiercina	8
32 Dulciana	8
33 Flute	4
34 Flautina	2
35 Cor Anglais (beating)	8
36 Clarinet	8

Sub Octave.

Super Octave.

Swell to Choir (sub).

Swell to Choir (unison).

Double Touch.

Swell to Choir (super).

Three Compound Composition
Keys for Choir Stops and Pedal
Stops and Couplers.

Two Compound Composition Keys
for Choir Couplers.

SOLO (6 Stops).

37 Diaphonic Horn.....	8
38 Rohrflöte	4
39 Bombarde	16
40 Tuba Mirabilis	8
41 Tuba Sonora	8
42 Orchestral Oboe.....	8

Sub Octave.

Super Octave.

Swell Pedal: — Three Composition
Keys for Solo Stops.

Two Composition Keys for Solo
Couplers.

PEDAL (13 Stops).

	<i>ft.</i>
43 Gravissima (lower octave resultant).....	64
44 Double Open Diapason....	32
45 Contra Violone	32
46 Tibia Profunda	16
47 Open Diapason	16
48 Violone	16
49 Bourdon	16
50 Octave Violone	8
51 Flute	8
52 Diaphone	32
53 Diaphone	16
54 Tuba Profunda	16
55 Tuba	8

Solo to Pedals.

Great to Pedals.

Swell to Pedals.

Choir to Pedals.

Ten Composition Keys controlling
Pedal Stops and Couplers.

Compass: Manuals, CC to c4 in
altmo., 61 notes.

Pedals, CCC to F, 30 notes.

GENERAL ACCESSORIES.

Stop Switch (Key and Pedal).

One Composition Pedal P.

One Composition Pedal F.

One Composition Pedal FF.

One Composition Pedal bringing
Couplers on.

One Composition Pedal taking
Couplers off.

[From "Musical Opinion."]

DOUBLE TOUCH PNEUMATIC ORGAN.

Mention has recently been made in these columns of the grand concert organ built (in 1863) by Mr. H. Wedlake to the order of Mr. Henry Alers Hankey, of Queen Anne's Mansions, St. James's Park. Unfortunately the instrument, as stated below, was destroyed by fire in 1875, it having been enlarged during that year. The specification, which we subjoin, was drawn up by the late Augustus L. Tamplin. The compass of the four manuals was from CC to C (five octaves), and the pedal clavier extended from CCC to G (thirty-two notes).

GREAT.

1 Double Diapason	16 ft.
2 Open Diapason	8
3 Horn Diapason	8
4 Claribel	8
5 Harmonic Flute.....	4
6 Principal	4
7 Octave.....	4
8 Fifteenth.....	2
9 Doublette	2 1
10 Double Trumpet	16
11 Grand Trumpet... ..	8
12 Octave Horn	4

5, 10, 11, 12 (Solo Organ) 6in.
pressure, remainder 8½in.

SWELL.

13 Bourdon	16
14 Open Diapason	8
15 Dulciana	8
16 Principal	4
17 Flute	4
18 Harmonic Piccolo	2
19 Double Bassoon.....	16
20 Cornopean	8
21 Oboe	8
22 Clarionet.....	8

SWELL—continued.

23 Clarion	4 ft.
24 Bells to tenor C by percussion action.	
19 to 23 (Solo Organ) 5in. pres- sure, remainder 3in.	

CHOIR.

25 Sub-Bass.....	16
26 Violin Diapason.....	8
27 Echo Dulciana	8
28 Viole d'Amour	8
29 Unda Maris, 2 ranks.....	8
30 Lieblich Flöte.....	8
31 Echo Harmonic Flute	4
32 Vienna Flute	4
33 Æoline-Harmonic	2
34 Piccolo	2
35 Vox Humana ..	8
36 Octave Oboe	4
30 to 36 (Solo Organ) 3½in. pres- sure, remainder 2½in.	

SOLO.

37 Bell Diapason.....	8
38 Hohl Flöte	8
39 Keraulophon	8

DOUBLE TOUCH PNEUMATIC ORGAN—continued.

SOLO—continued.

40 Concert Flute.....	8
41 Harmonic Flute.....	4
42 Piccolo	2
43 Euphone.....	16
44 Contra Bassoon	16
45 Harmonic Trumpet	8
46 Orchestral Oboe	8
47 Corno di Bassetto	8
48 Tuba Major	8
49 Octave Clarinet	8
50 Musette	2

43 to 50, 6in. pressure,
remainder 4in.

PEDAL.

51 Grand Double Unison, open pipe	32
52 Grand Unison	16
53 Bourdon	16
54 Dulciana	16
55 Bass Flute	8
56 Violoncello	8
57 Octave.....	4
58 Super-Octave	2
59 Contra Bombarde	32
60 Bass Trombone	16
61 Contra Bass Clarinet	16
62 Bass Clarinet	8
63 Octave Clarion ..	4

PEDAL—continued.

64*Concert Grand	16
65*Octave Grand.....	8
* By percussion action.	

COUPLERS.

66 Solo to Pedal.
67 Solo to Great.
68 Solo to Choir.
69 Swell to Choir.
70 Swell to Pedal.
71 Octave Swell to Pedal.
72 Super Swell to Pedal.
73 Octave Swell.
74 Sub-octave Swell.
75 Swell to Great.
76 Sub-octave Swell to Great.
77 Octave Swell to Great.
78 Great to Pedal.
79 Octave Great.
80 Sub-octave Great.
81 Octave Choir to Great.
82 Sub-octave Choir to Great.
83 Choir to Great.
84 Choir to Pedal.
85 Octave Choir.
86 Great Solo to Choir.
87 Sub-octave Solo to Choir.
88 Swell Solo to Choir.
89 Octave Pedal Organ.
90 Stringendo.
91 Entire Pedal Organ (64 and 65 excepted) to Choir Manual, the bottom pedal notes taken on at the Tenor C key.

MECHANICAL ARRANGEMENTS.

34 Thumb knobs, distributed in the following order between each set of keys and top of key cheeks: 6 to Solo, 6 to Swell, 6 to Great, 4 to Choir, 4 to Pedal, 8 Miscellaneous.

3 Stop Keys, balanced in middle: Great Solo to Choir off and on, Pedal Organ off and on, Swell Solo to Choir off and on.

12 Pedals, each acting on a series of couplers and thumb knob at the same time. That is to say, if you required a soft organ, by pressing No. 1 pedal it would produce the softest stop or stops on the manual with a

DOUBLE TOUCH PNEUMATIC ORGAN—continued.

corresponding stop on the pedal, and so on, increasing the power of manual and pedal in proportion as you pressed each pedal.

Swell, Solo, and Choir Tremulants by pedal.

Great to Pedal by pedal.

Sforzando action—Great to Swell—by pedal.

BELLOWS CHAMBER.

The main bellows—five in number, each 10ft. by 7ft.—were placed 60ft. away from the organ, the compressed air passing through metal tubes and supplying the reservoirs of different pressures to the various organs. By this means complete silence at the organ was obtained.

The bellows action was constructed on the cup and ball principle, and worked by three highly burnished gun metal hydraulic engines. Pressures of wind: $2\frac{1}{2}$ in. to 8in.

The instrument was enclosed in an elegant case of Moorish architecture made of polished Italian walnut, with gold embellishments. The front pipes were of highly burnished tin. The console—made of burr walnut and ebony—projected 4ft. from the case. It was mounted on an elaborate dais, covered with Turkey carpet.

The organ occupied the entire width of the grand music room and picture gallery, which was 35ft. wide and 100ft. long.

NOVEL INTRODUCTIONS.

1. Double touch arrangement. Each manual contained two distinct organs: one for the solo, and the other for the accompaniment. By the aid of the double touch action (to be drawn at pleasure on either manual), the performer was enabled to play a solo and accompaniment at one and the same time. For solo use the key was fully depressed; for accompaniment only at half depression. The half way touch was made sufficiently firm to allow of the accompaniment being played perfectly clear of the solo,—a matter of great importance.

2. Three pedal couplers to swell manual,—viz., swell to pedal octave, swell to pedal, and super-octave swell to pedal. By the agency of the two last named couplers the carillons (which commenced at tenor C on the swell organ) could be played either in unison or octaves, thus making a very beautiful combination with the pipe stops.

3. Stringendo coupler (swell to great), suggested and named by Mr. Tamplin, the action being invented by H. Wedlake. This was an escapement movement, the object of which was to pluck the action of the swell manual, thus giving the effect of strings to that organ, the sound of the great organ being at the same time retained.

4. By pressing a thumb knob, the entire pedal organ could be transferred to the choir manual, the attachment being the CCC of pedal to tenor C of choir.

DOUBLE TOUCH PNEUMATIC ORGAN—continued.

5. Pedal clavier of thirty-two notes, the scale in every respect as now used by the Royal College of Organists.

6. Crescendo pedal. The object of this pedal was, first of all, to open the swell louvres to their full extent and then to attack a great to swell action; the stops being drawn, a grand outburst of tone was the result.

7. Contra bass clarionet. This stop—the first of its kind—was specially introduced at Mr. Tamplin's request for certain effects he wished to obtain in his selection from Meyerbeer's opera, "Robert the Devil."

8. Pedal grand piano to be used for the first time with organ pipes, consisting of two stops (16ft. and 8ft.) played together or separately; an extra octave of strings to complete the 8ft. register, making in all forty-four notes. (This portion of the instrument was not complete when the great fire consumed the mansion and organ in the year 1875.)

ORGAN IN WESTMINSTER ABBEY,

By Messrs. W. Hill & Son.

The "Celestial Organ" which has recently been erected in Westminster Abbey, constitutes an unique feature among the Cathedral instruments of the country.

It is placed in the Triforium of the South Transept, at the extreme end, above the tomb of Handel, and is not visible from the church below. Though in all respects a separate organ, and complete in itself, it nevertheless forms a part of the grand instrument standing in the Choir (which now consists of seventy-seven speaking stops), insomuch as it is controlled from the same console, and can be used in conjunction with the latter.

The "Celestial Organ" consists of two sections, part belonging to a fifth row of keys, and part under control from the fourth or solo keyboard of the console; while, by means of various couplers, all the stops can be played from either manual, as desired.

The action is electric throughout, on the system invented by Messrs. W. Hill & Son, the connection being established by means of a small cable 200 feet in length.

ORGAN IN WESTMINSTER ABBEY—continued.

The stops are actuated by means of ivory stop-keys, with a sliding motion, placed over the left jamb of the console. These have a very small movement, and can be manipulated with extreme ease. If desired, the whole of the seventeen stops can be put on or off by one movement of the finger. The key contacts, electro-pneumatic movement at the soundboard, swell pedal movement and drawstop movement, are all on a new principle. The current, which is very small, is derived from three accumulator cells, which can be re-charged, when required, by means of a miniature dynamo attached to the blowing engine.

All the stops of the "Celestial Organ" are enclosed in a swell box, and are voiced to appropriate softness.

One of the novel features of the organ consists in a series of brass resonating gongs, thirty-six notes, which are likewise placed in the swell box, and are struck by means of electro-pneumatic hammers. Some quaint and remarkable effects are obtained from this stop.

The wind is supplied from three reservoirs, at different pressures, placed below the soundboards, and fed from zinc wind trunks, carried along the Triforium floor from the main organ.

The electric touches of both manual and pedal key-boards are instantaneous in action.

The following is the complete specification:—

GREAT, CC to A.		GREAT—continued.	
	<i>ft.</i>		<i>ft.</i>
1 Double Open Diapason, metal	16	12 Posaune, metal	8
2 Open Diapason, [1,] metal	8	13 Clarion, metal	4
3 Open Diapason, [2,] metal	8	CHOIR, CC to A.	
4 Open Diapason, [3,] metal	8	14 Gedeckt, wood	16
5 Hohl Flute, wood	8	15 Open Diapason, metal	8
6 Principal, metal	4	16 Keraulophon, metal	8
7 Harmonic Flute, metal	4	17 Dulciana, metal	8
8 Twelfth, metal	2½	18 Lieblich Gedeckt, wood ..	8
9 Fifteenth, metal	2	19 Principal, metal	4
10 Mixture, 4 ranks, metal ..		20 Nason Flute, wood	4
Reed Soundboard [heavier wind].		21 Suabe Flute, wood	4
11 Double Trumpet, metal ..	16	22 Harmonic Gemshorn, metal ..	4
		23 Contra Fagotto, metal	16
		24 Cor Anglais, metal	8

ORGAN IN WESTMINSTER ABBEY—continued.

SWELL, CC to A.

	<i>ft.</i>
25 Double Diapason, bass, wood	16
26 Double Diapason, treble, metal	16
27 Open Diapason, [1,] metal ..	8
28 Open Diapason, [2,] metal ..	8
29 Rohr Flute, wood & metal ..	8
30 Salcional, metal	8
31 Voix Céleste, metal	8
32 Dulciana, metal	8
33 Hohl Flute, wood	8
34 Dulcet, metal	4
35 Principal, metal	4
36 Lieblich Flute, metal	4
37 Fifteenth, metal	2
38 Mixture, 3 ranks, metal	
39 Oboe, metal	8
[On heavier wind.]	
40 Double Trumpet, metal	16
41 Cornopean, metal	8
42 Clarion, metal	4

SOLO, CC to A.

43 Gamba, metal	8
44 Rohr Flute, wood	8
45 Lieblich Flute, metal	4
46 Harmonic Flute, metal	4

[In a Swell.]

47 Orchestral Oboe, metal ..	8
48 Clarionet, metal	8
49 Vox Humana, metal	8

[On heavy wind.]

50 Tuba Mirabilis, metal	8
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CELESTIAL, CC to A.

[Light wind soundboard, fifth clavier.]

51 Double Dulciana, bass, wood	16
52 Double Dulciana, treble, metal	16

CELESTIAL—continued.

	<i>ft.</i>
53 Flauto Traverso, metal	8
54 Viola da Gamba, metal	8
55 Voix Céleste, metal	8
56 Hohl Flute, wood	8
57 Dulciana Cornet, 6 ranks..	

The following stops are available, when desired, on the solo keyboard, thus furnishing an independent instrument of two manuals; while in combination with coupler-keys Nos. 89 and 90, couplers 91 and 92 can be interchanged, thus reversing the claviers.

58 Cor de Nuit, wood & metal ..	8
59 Suabe Flute, wood	4
60 Flageolet, metal	2

[On heavier wind.]

61 Harmonic Trumpet, metal ..	8
62 Musette, metal	8
63 Harmonic Oboe, metal	8
64 Vox Humana, metal	8
65 Spare Slide.	
66 Glockenspiel, 3 ranks	
67 Gongs.	

PEDAL, CCCC to F.

68 Double Open Diapason, wood	32
69 Open Diapason, wood	16
70 Open Diapason, metal	16
71 Bourdon, wood	16
72 Principal, metal	8
73 Bass Flute, wood	8
74 Violoncello, wood	8

Reed Soundboards [heavier wind.]

75 Contra Posaune, metal	32
76 Posaune, metal	16
77 Trumpet, metal	8

ORGAN IN WESTMINSTER ABBEY—continued.

COUPLERS, Etc.

- 78 Swell to Great.
- 79 Swell Octave.
- 80 Swell to Choir.
- 81 Solo to Great.
- 82 Great to Pedal.
- 83 Swell to Pedal.
- 84 Choir to Pedal.
- 85 Solo to Pedal.
- 86 Solo Octave to Pedal.
- 87 Swell Tremulant.
- 88 Solo Tremulant.

COUPLER-KEYS
OF "CELESTIAL ORGAN."

- 89 Celestial to 5th Manual.
- 90 Celestial to 4th Manual.
- 91 Nos. 51 to 57 on 5th Manual.

COUPLER-KEYS—continued.

- 92 Nos. 58 to 67 on 4th Manual.
- 93 Celestial Octave.
- 94 Celestial Sub-Octave.
- 95 Celestial to Solo, Octave.
- 96 Celestial to Solo, Sub-Octave.
- 97 Celestial to Pedal.
- 98 Tremulant.
- 99 Wind.

Ten Pneumatic Combination Pedals, affecting Great, Swell and Pedal Stops.

Seven Combination Pistons to Solo and Choir.

Three Combination Pistons to Celestial.

Three Crescendo Pedals.

[From "*The Organist and Choirmaster.*"]

ORGAN IN THE PARISH CHURCH, DONCASTER.

Schulze's grand Organ in the Parish Church at Doncaster, has recently been undergoing complete renovation; and a considerable portion of the mechanism has been either renewed or improved. The work has been entrusted to Messrs. Abbott & Smith, of Leeds.

The Organ has been provided with new Manuals and a new Pedal-board, together with new Draw-stops, placed in jambs set at an angle of 50 degrees. The draw-stop action is now pneumatic throughout. The Pallets in the various sound-boards have been taken off and re-leathered.

There are five combination pistons to the Great Organ, acting on the Great and Pedal Organs in proportion, and there are three similar pistons to the Swell, all of which, very properly, are made to graduate from soft to loud, in

DONCASTER PARISH CHURCH ORGAN—continued.

the direction from left to right. There are also three pistons to the Choir Organ, which also act on the Solo Organ. All of these bring on soft Pedal Bases.

There are, in addition to the foregoing, four composition Pedals to the Great Organ, which bring on special combinations for solo playing, and three to the Swell for the same purpose.

Several new couplers have been added, also a new Tremulant to the Swell, and a double-acting foot pedal to work the "Great to Pedal" coupler.

The Organ is blown by three of Smith's air compressors, worked by a Shipley 24 gas engine. The engine and compressors are fitted up in a large room 120 feet from the Organ, the air being first drawn from the aisle in which the Organ stands, and then passed back through tubes running underground. This is done to secure equability between the temperature of the air in the church and the wind passed into the organ.

The following is a list of the Stops in the Doncaster Organ:—

GREAT (20 Stops).		SWELL (18 Stops).	
	ft.		ft.
1 Sub Bourdon	32	21 Bourdon	16
2 Double Open Diapason ..	16	22 Open Diapason	8
3 Bourdon	16	23 Gemshorn	8
4 Open Diapason	8	24 Terpodion	8
*5 Open Diapason	8	25 Rohr Flöte	8
6 Octave	8	26 Harmonic Flute	8
7 Stopped Diapason	8	27 Principal	4
8 Hohlflöte	8	28 Stopped Flute	4
9 Quint	5½	29 Viol d'Amour	4
10 Principal	4	30 Harmonic Flute	4
11 Gemshorn	4	31 Mixture, 5 ranks	
12 Stopped Flute	4	32 Scharf, 3 ranks	
13 Twelfth and Fifteenth.. 2½ & 2		33 Cornet, 4 ranks	
14 Mixture, 5 ranks		34 Double Bassoon	16
15 Cymbal, 3 to 5 ranks		35 Horn	8
16 Cornet, 4 ranks		36 Trumpet	8
17 Double Trumpet	16	37 Hautboy	8
18 Posaune	8	38 Clarion	4
19 Trumpet	8		
20 Clarion	4		

* Pipes not yet in.

DONCASTER PARISH CHURCH ORGAN—continued.

CHOIR (13 Stops).

	<i>ft.</i>
39 Lieblich Bourdon	16
40 Geigen Principal	8
41 Viol de Gamba	8
42 Lieblich Gedact	8
43 Flauto Traverso	8
44 Salicional	8
45 Hohl-flöte and Gamba	8
46 Geigen Principal	4
47 Lieblich Flöte	4
48 Flauto Traverso	4
49 Quintaton	4
50 Flautina	2
51 Clarionet	8

SOLO (9 Stops).

52 Gemshorn	8
53 Harmonic Flute	8
54 Rohr Flöte	8
55 Harmonic Flute	4
56 Stopped Flute	4
57 Double Bassoon	16
58 Horn	8
59 Hautboy	8
60 Vox Humana	8

ECHO (8 Stops).

61 Tibia Major	16
62 Vox Angelica	8
63 Harmonica	8
64 Flauto Traverso	8
65 Flauto Amabile	8
66 Celestina	4
67 Flauto Dolcissimo	4
68 Harmonica Aëtheria, 2 ranks	2½

PEDAL (25 Stops).

69 Sub Principal	32
70 Principal Bass	16
71 Sub-Bass	16
72 Open Diapason Bass	16
73 Major Bass	16
74 Violon	16
75 Quint Bass	10½

PEDAL—continued.

	<i>ft.</i>
76 Minor Bass	8
77 Flute Bass	8
78 Octave Bass	8
79 Violoncello	8
80 Great Tierce	6½
81 Twelfth Bass	5½
82 Fifteenth Bass	4
83 Tierce	3½
84 Mixture, 2 ranks	2½
85 Cymbal, 2 ranks	1½
86 Contra Posaune	32
87 Posaune	16
88 Bombarde	16
89 Contra Fagotto	16
90 Trumpet	8
91 Horn	8
92 Fagotto	8
93 Clarion	4

COUPLERS, &c.

94 Swell to Great.
95 Swell to Choir.
96 Choir to Great.
97 Echo to Solo.
98 Great to Pedal.
99 Swell to Pedal.
100 Choir to Pedal.
101 Thunder Pedal.

COMPASS:

Manuals, CC to a3 in Altmo., 58 notes.

Pedals, CCC to tenor f, 30 notes.

COMBINATION PISTONS.

Five acting on the Great Organ.
Four acting on the Swell Organ.
Three acting on the Choir and Solo Organs.

COMPOSITION PEDALS.

Four acting on the Great and Pedal Organs.
Three acting on the Swell Organ.
One Double-acting to work No. 5 Coupler.

ORGAN IN ST. GEORGE'S HALL, LIVERPOOL.

This noble instrument was built by Henry Willis, of London, to the specification of Dr. S. S. Wesley, by whom it was opened on the 29th and 30th of May, 1855. In 1867, at the request of the late Mr. W. T. Best, several improvements were effected, including the change of tuning from unequal to equal temperament, and the increase of the wind pressure on four of the reed stops of the Solo Organ from $9\frac{1}{2}$ inches to 22 inches. The wear and tear of 40 years' constant use has of course operated seriously upon the mechanism of the instrument, and some time ago the Corporation resolved to consult Mr. Willis, the builder, and Dr. Hopkins (Organist of the Temple Church, London), with the view of having the Organ completely renovated and modernised. A specification was prepared by these gentlemen, certain suggestions made by Dr. A. L. Peace, Organist to the Corporation, being also included. The work has now been completed, and as some of the details of the same may be of interest they are herewith presented.

1.—The thorough cleaning, repairing and setting up of the main structure of the instrument.

2.—The adoption of the CC to C compass (5 octaves) on the manuals in place of GG to A in alt.

3.—The extension of the compass of the pedal-board upwards from F to G.

4.—The provision of four new key-boards, ranging from CC to C—61 notes.

5.—The provision of a new pedal-board extending from CCC to G—32 notes.

6.—The provision of new handles of solid ivory to the drawstops.

7.—The introduction of new pneumatic action of the latest and most approved type in place of the old movements.

8.—The thorough repairing of the whole system of sound-boards, bellows, reservoirs and concussion valves.

9.—The transposition of the whole of the pipes of the manual organs, provision being made for changing the

ORGAN IN ST. GEORGE'S HALL, LIVERPOOL—continued.

pitch (by simple means) to the "French Diapason Normal," should it be generally adopted in this country at some future time.

10.—The replacing of the cast iron pipes of the lowest octave of the 32 feet Double Open Diapason on the Pedal Organ by pipes of stout zinc.

11.—The enclosing of a portion of the Solo Organ in a new swell box.

The following are the suggestions made by Dr. A. L. Peace:—

1.—The transference of the Vox Humana from the Swell Organ to the Solo Organ, in order to obtain a soft and varied accompaniment to it on the Swell Organ.

2.—The substitution of a Viol da Gamba in the Swell Organ for the Vox Humana transferred to the Solo Organ.

3.—The introduction into the Swell Organ of an Octave Viola in place of one of the Principals (No. 2).

4.—The provision of a Harmonic Piccolo in the Great Organ in lieu of one of the Fifteenths (No. 2).

5.—The conversion of the Posaune on the Pedal Organ into a Contra Fagotto, in order to provide this department of the instrument with a 16 feet reed stop of medium strength of tone.

6.—The addition of a tremulant to the Solo Organ.

7.—The introduction of a Swell to Choir Coupler.

8.—The making of the Sub and Super Octave Couplers to act on the Solo Organ Manual itself instead of through the medium of the Great Organ Manual.

9.—The addition of Sub and Super Octave Couplers to the Choir Organ.

10.—The completion of the compass of the Orchestral Oboe on the Solo and Choir Organ respectively.

11.—The enclosing in a swell box of two of the three Solo Organ sound-boards (instead of one as suggested), thereby gaining the means of expression from more stops, as well as a much more spacious box.

12.—The provision of four composition pedals to act on the Swell Organ.

ORGAN IN ST. GEORGE'S HALL, LIVERPOOL—continued.

13.—The concentration of the whole of the Pedal Organ draw-stops on one side of the keyboards, the Couplers being arranged in a similar manner on the opposite side.

14.—The substitution of a Viol da Gamba in the Solo Organ for the Double Diapason, which is required to be removed to provide room for the new swell box.

The following is the specification of the Organ as it now stands, in its revised form :—

CHOIR, 18 Stops.

Compass CC to C, 61 Notes.

	<i>ff.</i>
1 Double Diapason	16
2 Open Diapason ..	8
3 Claribella	8
4 Stopped Diapason.....	8
5 Dulciana	8
6 Viol da Gamba	8
7 Vox Angelica	8
8 Principal	4
9 Harmonic Flute.....	4
10 Gamba.....	4
11 Twelfth ..	2½
12 Fifteenth	2
13 Flageolet	2
14 Sesquialtera, 3 ranks...	
15 Trumpet	8
16 Cremona	8
17 Orchestral Oboe.....	8
18 Clarion.....	4

GREAT, 25 Stops.

Compass CC to C, 61 Notes.

19 Double Open Diapason, metal	16
20 Open Diapason	8
21 Open Diapason ..	8
22 Open Diapason, wood ..	8
23 Open Diapason	8
24 Stopped Diapason.....	8

GREAT—continued.

	<i>ff.</i>
25 Violoncello	8
26 Quint	5½
27 Viola	4
28 Principal	4
29 Principal	4
30 Flute	4
31 Tenth	3½
32 Twelfth	2½
33 Fifteenth	2
34 Harmonic Piccolo	2
35 Doublette, 2 ranks	
36 Sesquialtera, 5 ranks.....	
37 Mixture, 4 ranks	
38 Trombone	16
39 Trombone	8
40 Ophicleide	8
41 Trumpet	8
42 Clarion	4
43 Clarion	4

SWELL, 25 Stops.

Compass CC to C, 61 Notes.

44 Double Diapason, metal ...	16
45 Open Diapason	8
46 Open Diapason	8
47 Dulciana ..	8
48 Viol da Gamba ..	8
49 Stopped Diapason.....	8
50 Voix Celeste ..	8
51 Principal	4

ORGAN IN ST. GEORGE'S HALL, LIVERPOOL—continued.

SWELL—continued.

	<i>ft.</i>
52 Octave Viola	4
53 Flute	4
54 Twelfth	2 $\frac{3}{4}$
55 Fifteenth	2
56 Fifteenth	2
57 Piccolo	2
58 Doublette, 2 ranks	
59 Fourniture, 5 ranks	
60 Trombone	16
61 Contra Hautboy	16
62 Ophicleide	8
63 Trumpet	8
64 Horn	8
65 Oboe	8
66 Clarinet	8
67 Clarion	4
68 Clarion	4

SOLO, 15 Stops.

Compass CC to C, 61 Notes.

69 Viol da Gamba	8
70 Open Diapason, wood	8
71 Stopped Diapason	8
72 Flute (Orchestral)	4
73 Flute Piccolo	2
74 Contra Fagotto	16
75 Trombone	8
76 Bassoon	8
77 Vox Humana	8
78 Orchestral Oboe	8
79 Corno di Bassetto	8
80* Ophicleide	8
81* Trumpet	8
82* Clarion	4
83* Clarion	4

These stops are all placed in a new swell-box, except those marked *, which are on the heavy wind pressure.

PEDAL, 17 Stops.

Compass CCC to G, 32 Notes.

	<i>ft.</i>
84 Double Open Diapason, wood	32
85 Double Open Diapason, metal	32
86 Open Diapason, wood	16
87 Open Diapason, metal	16
88 Salcional, metal	16
89 Bourdon, wood	16
90 Principal, metal	8
91 Principal, wood	8
92 Quint, metal	5 $\frac{1}{2}$
93 Fifteenth	4
94 Fourniture, 5 ranks	
95 Mixture, 3 ranks	
96 Possaune	32
97 Contra Fagotto	16
98 Ophicleide	16
99 Trumpet	8
100 Clarion	4

COUPLERS.

101 Solo Super Octave.
102 Solo Sub-Octave.
103 Solo to Great.
104 Swell to Great Super Octave.
105 Swell to Great Unison.
106 Swell to Great Sub-Octave.
107 Swell to Choir.
108 Choir to Great.
109 Choir Super Octave.
110 Choir Sub-Octave.
111 Solo to Pedals.
112 Swell to Pedals.
113 Great to Pedals.
114 Choir to Pedals.

ORGAN IN ST. GEORGE'S HALL, LIVERPOOL—continued.

In addition to these coupling movements there are other accessories, consisting of 36 pneumatic pistons, 6 to each manual, and 12 acting upon the Pedal stops. There are also 6 composition pedals acting upon the "Great" and "Pedal" stops simultaneously, and 4 pedals acting upon the Swell Organ pistons. The Swell and Solo Organs are each provided with tremulants.

Two large bellows in the basement of the Hall, and blown by two steam engines of 8 h.p. and $\frac{1}{2}$ h.p. respectively, supply the wind, which passes from the bellows to 14 reservoirs in various positions in the instrument, the pressure varying from $3\frac{1}{2}$ to 22 inches.

[By kind permission of the late Dr. W. Spark, abridged from his "Musical Reminiscences."]

THE ORGAN IN LEEDS TOWN HALL,

By Messrs. Gray and Davison, London and Liverpool.

About the year 1856 the Organ Committee of the Leeds Corporation (assisted by an expert,) offered a premium of £150 for the best scheme and plans for a large and suitable organ to be placed in the Orchestra of the New Town Hall. This premium after due consideration was awarded to Dr. W. Spark, of Leeds, and the late Mr. Henry Smart, of London, and the tender of Messrs. Gray and Davison was accepted for building the organ under their joint superintendence. It is upwards of 50ft. in height, about 47ft. in width, and is 25ft. deep in the centre. The total cost including the case and hydraulic engines was about £6,500. The organ has four manuals, each from CC to C 61 notes, and a pedal clavier from CCC to F, 30 notes. The twenty-six stops in the great organ are disposed on nine sound-boards of ample dimensions, and the

LEEDS TOWN HALL ORGAN—continued.

pressure of wind with which they are supplied is increased twice in the range of the compass, and the Reeds have a higher initial pressure of wind than that of the flue work. The Great Organ Stops are also divided into two distinct masses, twelve stops being placed on the "front" sound-boards which are calculated to form a comparatively light, though powerful and brilliant organ, whilst the remaining fourteen stops placed on the "back" sound-boards form a "band" entirely different to the foregoing in amount and quality of tone. These two organs may, by the use of a pedal operating on the wind of the "back," be used separately or in conjunction, with instantaneous effect.

The twenty stops of the swell organ are disposed on four sound-boards, the two front ones containing all the Reeds being supplied with wind at one inch heavier pressure than that allotted to the flue work.

The composition pedals act by an instantaneous adjustment on the Swell alone, or on the Swell, Great, and Pedal Organs, or on the two latter only: there are also numerous mechanical contrivances and conveniences.

The superb case, designed by Mr. Cuthbert Brodrick, and skilfully executed by Messrs. Thorpe and Atkinson of Leeds, cost £774, and the pipes were decorated by Mr. Craice, of London.

After severe competition Dr. Spark was appointed as the Organist.

THE ORCHESTRAL SOLO ORGAN (Uppermost Clavier) contains the following stops:—

By Pipes on Sound Boards.

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon	8	61	6 Oboe	8	49
2 Concert Flute			7 Cor Anglais and		
Harmonic	8	49	Bassoon (free		
3 Piccolo Harmonic	4	49	reed)	8	61
4 Ottavino Harmonic	2	61	8 Tromba	8	61
5 Clarinet	8	61	9 Ophicleide.....	8	61

LEEDS TOWN HALL ORGAN—continued.

By Mechanical Combination.

- | | |
|------------------------------------|----------------------------------|
| 10 Clarinet and Flute, in octaves. | 14 Oboe and Bassoon, in ditto. |
| 11 Oboe and Flute, in ditto. | 15 Flute, Clarinet, and Bassoon, |
| 12 Clarinet and Bassoon, in ditto. | in double octaves. [ditto |
| 13 Clarinet and Oboe, in ditto. | 16 Flute, Oboe, and Bassoon, in |

THE SWELL ORGAN (Second Clavier) contains the following stops:—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon	16	61	10 Twelfth	3	61
2 Open Diapason ...	8	61	11 Fifteenth	2	61
3 Stopped Diapason			12 Piccolo.....	2	61
(treble)	8	49	13 Sesquialtera.....	4 ranks	244
4 Stopped Diapason			14 Mixture	3 ranks	183
(bass)	8	12	15 Contra Fagotto ...	16	61
5 Keraulophon* ...	8	49	16 Trumpet	8	61
6 Harmonic Flute ...	8	49	17 Cornopean	8	61
7 Octave	4	61	18 Oboe	8	61
8 Gemshorn	4	61	19 Vox Humana	8	61
9 Wood Flute	4	61	20 Clarion.....	4	61

*This stop, invented by Messrs. Gray and Davison, was first introduced in the organ built by them for St. Paul's, Wilton Place, in 1843. It was also in their organ in the great Exhibition of 1851, for which a Council medal was awarded.

The GREAT ORGAN (Third Clavier) contains, in reality, two complete and distinct organs, of different powers and qualities. One, called the "Front Great Organ," contains the following Stops:—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Double Diapason			7 Twelfth	3	61
(open metal) ..	16	61	8 Fifteenth	2	61
2 Open Diapason ...	8	61	9 Quint Mixture.....	4 ranks	244
3 Spitz Gamba	8	61	10 Tierce Mixture ...	5 „	305
4 Stopped Diapason	8	61	11 Trumpet	8	61
5 Octave.....	4	61	12 Clarion.....	4	61
6 Wald Flöte.....	4	61			

The contents of the "Back Great Organ" are as follows:—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
13 Bourdon	16	61	20 Piccolo Harmonic	2	61
14 Flute à Pavillon ...	8	61	21 Cymbal	3 ranks	183
15 Viola	8	61	22 Furniture.....	4 ranks	244
16 Flute Harmonic ...	8	61	23 Contra Trombone	16	61
17 Quint	6	61	24 Trombone	8	61
18 Octave	4	61	25 Trumpet Harmonic	8	61
19 Flute Octavante	4	54	26 Tenor Trombone	4	61

LEEDS TOWN HALL ORGAN—continued.

The CHOIR ORGAN (Lowermost Clavier) contains the following stops :—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Sub-Dulciana	16	61	9 Flute Harmonic ...	4	49
2 Open Diapason ...	8	61	10 Twelfth	3	61
3 Rohr Flute (metal)	8	49	11 Fifteenth	2	61
4 Stopped Diapason			12 Octavino (wood) ..	2	61
(bass) wood ..	8	12	13 Dulciana Mixture	5 ranks	305
5 Salcional	8	61	14 Euphone (free reed)	16	61
6 Viol de Gamba ...	8	49	15 Trumpet	8	61
7 Octave	4	61	16 Claion.....	4	61
8 Suabe Flute	4	49			

The ECHO ORGAN* (which can be played on either the Solo or Choir Clavier) contains the following stops :—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Bourdon (wood)...	16	49	5 Flute d'Amour		
2 Dulciana (metal)...	8	49	(metal)	4	61
3 Lieblich Gedacht			6 Dulciana Mixture		
(wood)	8	61	(metal)	4 ranks	244
4 Flute Traverso			7 Carillons Tenor F to C in alt.		
(wood)	4	61			

*The Echo Organ was added in 1865; it formed part of the original plan, and was only omitted at first on the score of expense.

The PEDAL ORGAN contains the following stops :—

	<i>ft.</i>	<i>pipes</i>		<i>ft.</i>	<i>pipes</i>
1 Sub-Bass (open			8 Octave	8	30
metal)	32	30	9 Violoncello	8	30
2 Contra Bourdon			10 Twelfth	6	30
(wood)	32	30	11 Fifteenth	4	30
3 Open Diapason			12 Mixture	5 ranks	150
(wood)	16	30	13 Contra Bombard		
4 Open Diapason			(free reed)	32	30
(wood)	16	30	14 Bombard.....	16	30
5 Violin (wood)	16	30	15 Fagotto	16	30
6 Bourdon (wood)...	16	30	16 Clarion.....	8	30
7 Quint (open wood)	12	30			

The COUPLING STOPS are as follows :

1 Solo Organ to Great Clavier.	4 Solo Organ Sub-octave (ditto)
2 Great Organ to Solo Clavier.	5 Swell Organ to Great, Super
3 Solo Organ Super Octave (on	Octave.
its own Clavier).	6 Swell Organ to Great, Unison.

LEEDS TOWN HALL ORGAN—continued.

COUPLERS—continued.

7 Swell Organ to Great, Sub-Octave.	12 Great Organ to Pedal Clavier.
8 Swell Organ to Choir Clavier.	13 Full Pedal Organ.
9 Choir Organ to Great, Unison.	14 Solo Organ to Pedal Clavier.
10 Swell Organ to Pedal Clavier.	15 Echo Organ to Solo Clavier.
11 Choir Organ to ditto.	16 Echo Organ to Choir Clavier.
	17 Tremulant to Echo Organ.

The PEDALS, etc., for various purposes of mechanical adjustment, are as follows:—

1 Swell Pedal.	6, 7, 8, 9. Composition Pedals.
2 Swell Pedal for Solo Organ.	10 Crescendo Pedal.
3 Swell Tremulant Pedal.	11 Diminuendo Pedal.
4 Pedal admitting wind to the Back Great Organ.	12, 13, 14, 15. Index to Composition Pedals.
5 Pedal coupling the Back Great Organ to Swell Clavier.	16 and 17. Wind Couplers to Composition Pedals.

SUMMARY OF DRAW STOPS, ETC:—

Solo Organ	...	...	...	9
Combination Solo Organ	...	...	...	7
Swell Organ	..	...	...	20
Great Organ—Front 12, Back 14	...	...	...	26
Choir Organ	...	...	...	16
Echo Organ	...	...	...	7
Pedal Organ	...	..	...	16
Coupling Stops	...	..	...	17

Making a total of 118 Stops.

Besides 17 composition and other pedals for various movements, making altogether 135.

SUMMARY OF PIPES:—

Solo Organ	...	...	...	513
Swell Organ	...	...	...	1,440
Great Organ	...	...	...	2,311
Choir Organ	...	...	...	1,123
Echo Organ	...	...	...	525
Pedal Organ	..	...	...	600
Total	...	...	...	6,512

This Organ is being greatly altered by Messrs. Abbott and Smith, the authorities spending over £3,000 upon it; but the exact alterations are not yet finally fixed upon.

[From "*Musical Opinion.*"]ROYAL ALBERT HALL ORGAN, KENSINGTON
GORE, LONDON,

By Mr. Henry Willis, London.

PEDAL.

	<i>ft.</i>
1 Double Open Diapason ..	32
2 Double Open Diapason ..	32
3 Contra Violone	32
4 Open Diapason	16
5 Open Diapason	16
6 Bourdon	16
7 Violone	16
8 Great Quint	12
9 Violoncello	8
10 Octave	8
11 Quint	6
12 Super Octave	4
13 Furniture 5 ranks	
14 Mixture 3 ranks	
15 Contra Posaune	32
16 Contra Fagotto	16
17 Bombarde ..	16
18 Ophicleide	16
19 Trombone	16
20 Fagotto	8
21 Clarion	8

CHOIR.

22 Violone	16
23 Viola da Gamba	8
24 Dulciana	8
25 Lieblich Gedact	8
26 Open Diapason	8
27 Vox Angelica	8
28 Principal Harmonique....	4
29 Gemshorn	4
30 Lieblich Flöte	4
31 Celestina	4
32 Flageolet	2
33 Piccolo Harmonique	2
34 Super Octave	2
35 Mixture 3 ranks	

CHOIR—continued.

	<i>ft.</i>
36 Corno-di-Bassetto	16
37 Clarionet	8
38 Cor Anglais	8
39 Oboe	8
40 Trompette Harmonique 16 & 8	
41 Clarion	4

GREAT.

42 Flûte Conique (partly harmonic)	16
43 Contra Gamba	16
44 Violone	16
45 Bourdon	16
46 Open Diapason	8
47 Open Diapason	8
48 Viola da Gamba	8
49 Claribel	8
50 Flûte Harmonique	8
51 Flute à Pavillon	8
52 Quint	6
53 Flûte Octaviant Har- monique	4
54 Viola	4
55 Octave	4
56 Quint Octaviant	3
57 Piccolo Harmonique	2
58 Super Octave	2
59 Furniture 5 ranks	
60 Mixture 5 ranks	
61 Contra Posaune	16
62 Posaune	8
63 Trompette Harmonique 16 & 8	
64 Tromba	8
65 Clarion Harmonique ..	8 & 4
66 Clarion	4

ROYAL ALBERT HALL ORGAN—continued.

SWELL.		SOLO—continued.	
	<i>ft.</i>		<i>ft.</i>
67 Double Diapason	16	96 Claribel Flute.....	8
68 Bourdon	16	97 Voix Céleste	8
69 Salicional	8	98 Flûte Traversière	4
70 Open Diapason	8	99 Concert Flute.....	4
71 Viola da Gamba	8	100 Piccolo Harmonique....	2
72 Flûte à Cheminées	8	101 Cymbale	
73 Claribel Flute	8	102 Corno-di-Bassetto	16
74 Quint	6	103 Clarinet	8
75 Flûte Harmonique	4	104 Bassoon	8
76 Viola	4	105 French Horn	8
77 Principal	4	106 Ophicleide	8
78 Quint Octavante	3	107 Trombone	8
79 Super Octave	2	108 Oboe	8
80 Piccolo Harmonique	2	109 Bombardon	16
81 Sesquialtera 5 ranks		110 Tuba Mirabilis	8
82 Mixture	5 ranks	111 Tuba Clarion	4
83 Contra Posaune	16		
84 Contra Oboe	16		
85 Baryton	16		
86 Voix Humane	8		
87 Oboe	8		
88 Cornopean	8		
89 Tuba Major	8		
90 Tuba	4		
91 Clarion	4		
SOLO.		COUPLERS.	
92 Contra Basso	16	112 Solo Sub-octave (on itself).	
93 Flûte à Pavillon	8	113 Solo Super-octave (on itself).	
94 Viol d'Amour	8	114 Swell Sub-octave (on itself).	
95 Flûte Harmonique	8	115 Swell Super-octave on itself.	
		116 Unison Solo to Great.	
		117 Unison Swell to Great.	
		118 Unison Choir to Great.	
		119 Swell to Choir.	
		120 Solo to Choir.	
		121 Solo to Pedals.	
		122 Swell to Pedals.	
		123 Great to Pedals.	
		124 Choir to Pedals.	
		125 Sforzando.	

The compass of the four manual claviers extends from CC to C in alt. (sixty-one notes), and that of the pedale from CCC to G (thirty-two notes). The violone, dulciana, vox angelica, gemshorn, celestina, flageolet, mixture, and cor anglais, on the choir organ, are intended to represent what is called the echo organ in some large organs, and in them placed on a fifth clavier. A double-acting vertical movement, struck by the heel of either foot, instantly de-

ROYAL ALBERT HALL ORGAN—continued.

taches and connects the movement of the pedal organ from all but the bourdon, violone, open diapason (metal), and octave, and also draws and withdraws the pedal coupler to great organ. Eight patent pneumatic combination pistons govern the whole of the stops of each manual organ. These thirty-two pistons appear immediately below and in front of each clavier. Six pedals govern the stops of the pedal organ by means of ventils. Two pedals apply and detach a movement which causes the aforesaid six pedals governing the pedal organ to act also upon the combination movement of the great organ. Six pedals govern and combine in various ways all the other accessories, and thus, by one instantaneous operation of the performer, vary the effect of the whole instrument at once. Two tremulants, governed by pedals (one to the swell, the other to the solo organ,) are applied. These tremulants act only upon suitable stops. The sforzando is brought into action by means of a pedal. Two pedals govern the great to pedal coupler. The patent atmospheric contrivance for actuating the swell independently of the swell pedal is also applied.

[From "*Musical Opinion*."]]

THE ORGAN AT SYDNEY TOWN HALL.

Although some organ builders and other gentlemen in England knew that a large organ was in contemplation for Sydney Town Hall, many people were astonished to see in *Musical Opinion* for May, 1887, the specification of so grand an instrument; which, moreover, included a pedal reed stop of 64ft. pitch. This is a beating reed of true length. The specification was drawn up by the builders, Messrs. W. Hill & Son, the late Thomas Hill (died 1893) being head of the firm. The case is of great size, and holds in the centre the 32ft. metal pipes of the double

SYDNEY TOWN HALL ORGAN—continued.

open diapason; the style is Northern Renaissance of the seventeenth century, strictly after the model of the finest ancient examples. It was designed by Mr. Arthur G. Hill, M.A., son of the former gentleman, and now the representative of this old house. The organ now contains 128 speaking stops (this number including the new "chimes" and "thunder"), 14 manual and 2 pedal couplers, 3 balanced swell pedals, and 8,800 pipes and chimes. There are 33 pneumatic combination studs, 6 combination pedals to the pedal organ, tremulants, &c. Interest in the organ did not cease with its opening in 1890 (when Mr. W. T. Best gave the initial series of twelve recitals, which were a great success), for we are frequently in receipt of communications from people residing in different parts of the world asking for information. For that reason, and as the number containing the particulars has long been out of print, we republish the specification, and also draw attention to the alterations made in it since it was first published. A gentleman living in a distant colony quite recently wrote saying that he had been told that there was somewhere in Australia a large organ containing a 64ft. reed, and could we tell him if it was a success? Perhaps he contemplates a second stop of that length. We are surprised at these belated enquiries, seeing that the specification has been published in English, Australian, American, and German publications: and can only suppose that a new generation of organ lovers has sprung up that knows not Joseph!

Since the erection of the organ a few alterations have been carried out under the direction of the organist, Mr. Wiegand. Originally, only the swell organ and the reeds of the choir were enclosed; now the whole of the swell, choir, and solo (with the exception of the high pressure 16ft., 8ft., and 4ft. tubas in the latter division) are enclosed. Each of the enclosed organs has a balanced pedal, and these pedals are placed close together in order that the performer may work two at once. Two new stops have been introduced to produce the effects of chimes and

SYDNEY TOWN HALL ORGAN—continued.

thunder. The chime is composed of thirty-eight steel bars. The vox humana has been removed from the choir to the swell. Two 4ft. stops on the choir (voix célestes and violino) are now 8ft. The 8ft. trumpet on the swell has been removed to the choir. The organist states that the swell gemshorn 4ft. is now 8ft.; but the English translation in the Australian pamphlet says that this alteration has been made in the "choir," which is obviously incorrect, seeing that this department does not contain a gemshorn. We notice that the stop on the choir marked *lieblich gedackt* 8ft. in the first specification is now *bourdon* 8ft., and that the *lieblich flöte* 4ft. has become *lieblich gedackt* 4ft. Likewise, the new list shows four alterations in the nomenclature of the stops of the pedal. A tremulant has been added to the swell. We also notice that the harmonic piccolo in the swell is of 1ft. pitch, instead of 2ft. as previously. Apparently changes have been made in the combination pedals, for no mention is made of those which the builders originally applied.

Sydney Town Hall is 65ft. in height, 85ft. in width, and 116ft. in depth.

The pedal key-board is according to the rules of R.C.O. The blowing apparatus is worked by a gas engine of 8 h.p. Tubular pneumatic action is used. The organist says that the effect of the 64ft. stop is truly marvellous, and its expression very distinct in spite of its volume and depth. The instrument took three years to build; and it was stated at the time of its erection to have cost £15,000. But we are now told that £16,000 has been spent, so perhaps the additional thousand represents the price of the alterations. The specification, which follows, is taken from a diagram of the key-board, stops, pistons, and pedals, published by the organist:—

SYDNEY TOWN HALL ORGAN—continued.

GREAT.

	<i>ft.</i>
1 Contra Bourdon (tenor C)	32
2 Bourdon	16
3 Double Open Diapason	16
4 Open Diapason	8
5 Open Diapason	8
6 Open Diapason	8
7 Open Diapason	8
8 Harmonic Flute	8
9 Viola	8
10 Spitz Flöte	8
11 Gamba	8
12 Hohl Flöte	8
13 Rohr Flöte	8
14 Quinte	6
15 Harmonic Flute	4
16 Principal	4
17 Octave	4
18 Gemshorn	4
19 Twelfth	3
20 Fifteenth	2
21 Mixture, 3 ranks	
22 Cymbal, 4 ranks	
23 Sharp Mixture, 4 ranks	
24 Furniture, 5 ranks	
25 Contra Posaune	16
26 Posaune	8
27 Trumpet	8
28 Clarion	4

SWELL.

29 Double Open Diapason ...	16
30 Bourdon	16
31 Open Diapason	8
32 Viola di Gamba	8
33 Salicional	8
34 Dulciana	8
35 Vox Angelica	8
36 Hohl Flöte	8
37 Gemshorn	8
38 Octave	4
39 Harmonic Flute	4
40 Rohr Flöte ..	4
41 Twelfth	3
42 Fifteenth	2

SWELL—continued.

	<i>ft.</i>
43 Harmonic Piccolo	1
44 Mixture, 4 ranks	
45 Furniture, 5 ranks	
46 Trombone	16
47 Bassoon	16
48 Horn	8
49-Vox Humana	8
50 Cornopean	8
51 Oboe	8
52 Clarion	4
53 Thunder	64
54 Swell Tremulant.	

CHOIR.

55 Contra Dulciana	16
56 Open Diapason	8
57 Gamba	8
58 Dulciana	8
59 Flauto Traverso	8
60 Hohl Flöte	8
61 Bourdon	8
62 Violino	8
63 Voix Célestes	8
64 Octave	4
65 Lieblich Gedackt	4
66 Twelfth	3
67 Fifteenth	2
68 Dulcet	2
69 Dulcet Mixture, 3 ranks	
70 Bassoon	16
71 Trumpet	8
72 Clarionet	8
73 Oboe	8
74 Octave Oboe ..	4

SOLO.

75 Bourdon	16
76 Open Diapason	8
77 Violin Diapason	8
78 Flauto Traverso	8
79 Doppel Flöte	8
80 Stopped Diapason	8
81 Viola	8
82 Octave	4

SYDNEY TOWN HALL ORGAN—continued.

SOLO—continued.

	<i>ft.</i>
83 Flauto Traverso	4
84 Harmonic Flute.....	4
85 Flauto Traverso	2
86 Contra Fagotto	16
87 Cor Anglais	8
88 Corno di Bassetto	8
89 Orchestral Oboe.....	8
90 Harmonic Trumpet	8
91 Octave Oboe	4
92 Contra Tuba	16
93 Tuba	8
94 Clarion Tuba	4
95 Carillons, 38 Steel Bars.	
96 Solo Tremulant.	

ECHO.

97 Viole d'Amour.....	8
98 Unda Maris, 2 ranks	8
99 Lieblich Gedackt	8
100 Viole d'Amour	4
101 Echo Dulciana Cornet, 4 ranks	
102 Glockenspiel, 4 ranks	
103 Flageolet	2
104 Basset Horn	8

PEDAL.

105 Double Open Diapason (wood)	32
106 Double Open Diapason (metal)	32
107 Contra Bourdon (wood) ..	32
108 Open Diapason (wood) ..	16
109 Open Diapason (metal) ..	16
110 Violone	16
111 Gamba	16
112 Dulciana	16
113 Bourdon	16
114 Quinte	12
115 Octave	8
116 Flute	8

PEDAL—continued.

	<i>ft.</i>
117 Violoncello	8
118 Bourdon	8
119 Twelfth	6
120 Prestant.....	4
121 Mixture, 3 ranks	
122 Furniture, 4 ranks	
123 Mixture, 2 ranks	
124 Contra Trombone (wood)	64
125 Contra Posaune (metal) ..	32
126 Posaune.....	16
127 Trombone	16
128 Bassoon	16
129 Trumpet	8
130 Clarion	4

COUPLERS.

131 Great to Pedal.
132 Swell to Pedal.
133 Choir to Pedal.
134 Solo to Pedal.
135 Swell to Great.
136 Solo to Great.
137 Swell Sub-Octave.
138 Swell Octave.
139 Solo Octave.
140 Choir to Great.
141 Solo to Choir.
142 Swell to Choir.
143 Echo to Swell.
144 Pedal to Great Pistons.

Engineer's Signal.
 Conductor's Electric Bell.
 Manuals—CC to C.
 Pedal—CCCC to F.
 8 Pneumatic Combination Studs
 to Great Organ, 8 to Swell, 7 to
 Solo, 7 to Choir, and 3 to Echo.
 6 Pedale Separée.
 Choir Tremulant by Pedal.
 Pedal for Solo to Great, also for
 Great to Pedal.

This is the largest Organ in the World.

[Inserted by kind permission of the Council of The Royal
College of Organists.]

The Royal College of Organists,

HART STREET, BLOOMSBURY,

LONDON, W.C.

REPORT OF THE COUNCIL

ON PROCEEDINGS IN CONNECTION

WITH THE

Conference on Organ Construction.

WITHDRAWN, SEE PAGE 353.

REPORT OF THE COUNCIL OF THE ROYAL COLLEGE OF ORGANISTS

ON PROCEEDINGS IN CONNECTION WITH THE CONFERENCE ON ORGAN CONSTRUCTION.

Acting upon an excellent and valuable suggestion, it was decided to hold a meeting on June 15th, 1880, to consider various questions concerning the certainty and convenience of organ playing, now so greatly and disadvantageously affected by the general want of uniformity as regards the external arrangements and measurements of the instrument. The serious attitude of the meeting in question led to the proposal that a conference should be called of organists and organ builders. To this end a printed form of questions concerning the arrangements and measurements of those portions of the organ which are directly the medium of the player's control over the instrument was drawn up, and prefaced by the following letter:—

DEAR SIR,—

In view of the proposed Conference of Organists and Organ Builders, presently to be convened under the auspices of the College of Organists, to fully discuss possible improvements in organ building, especially with regard to GREATER UNIFORMITY IN THE EXTERNAL ARRANGEMENTS OF ORGANS, the Council feel it desirable to gather some preliminary information as to the actual variety of plans existing. Any suggestions you may have to offer as regards the matter and detail will be duly valued. Information, in answer to questions on printed forms with respect to the organ or organs under your observation, will also be esteemed. As it is hoped that the proposed Conference will take place early in January, your early con-

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sideration of this subject, so important to the further advancement of the art of organ playing, will greatly oblige the College Council. Extra copies of this form will be sent on application.

I remain, dear Sir,

Yours sincerely,

E. H. TURPIN, *Hon. Secretary.*

November 22nd, 1880.

In accordance with instructions from the Council, copies of this form and the accompanying letter were not only sent to all members of the College, and to the organ builders, but also to many organists, non-members of the College. A large number of the forms were returned more or less completely filled up, and these afforded a vast amount of information as to the various points of detail. The particulars thus gained were collected and collated, ready for use and reference at the opening meetings of the Conference, which were held on three successive days early in January, 1881. With regard to the conduct and object of these meetings, and indeed throughout the series of conference meetings, the College Council decided to invite the presence of all interested in the important questions at issue, and to encourage the freest possible expression of opinion and the fullest possible discussion upon the various topics brought forward. From the first the Council clearly announced that the general object of the Conference was to define, but in no arbitrary spirit, a standard of measurements and external arrangements for instruments of all sizes, so that organists might in all cases, whatever the capacities of the different organs to be played upon, find such general points of external uniformity as would secure fair certainty and comfort in performance. The wide basis upon which the Council sought advice and help, and the self-evident reasonableness of the ends sought to be gained, at once secured the earnest and cordial support of almost the whole organ-building interest, of a large number of organists who gave their time and esteemed presence; of

a still larger number of organ-players who gave their moral support either verbally or by correspondence, and of the musical papers in both England and America.

At the close of the series of public conference meetings the College Council, with much thought and with a due sense of responsibility, fully considered the opinions which had been expressed, and also carefully balanced collateral evidence concerning the different points discussed. They now present the result.

Each chief decision of the Council is herein expressed as a *resolution*. Their judgment upon those subordinate points which less affect the general principles of uniformity, or which may be regarded as instances of the more or less successful application of inventive skill, has, in each case, been put in the form of a *recommendation*.

RESOLUTIONS.

1. That the compass of the pedals be from CCC to F, *i.e.*, 30 notes.
2. That the pedals be parallel.
3. That the pedals be concave, with radial top facings; and that the concavity be the arc of a circle having a radius of eight feet six inches.
4. That the length of the centre natural key of the pedals be not less than 27 inches.
5. That the front of the pedal short keys form an arc of a circle, having a radius of eight feet six inches; and that the length of the centre short key of the pedals be not less than five and a half inches.
6. That the pedal scale be two and three-eighth inches from centre to centre of two adjacent natural keys.
7. That a plumb-line dropped from the middle C of the manuals fall on the centre C of the pedal-board.

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8. That a plumb-line dropped from the front of the Great Organ sharp keys fall two inches nearer the player than the front of the centre short key of the pedal-board.
9. That the height of the upper surface of the Great Organ natural key, immediately over the centre of the pedal-board, be 32 inches above the upper surface of the centre natural key of the pedal-board.
10. That the relationship between manuals and pedals, be subservient to the fixed relative position of the Great Manual key-board and the pedal-board already defined: it being understood that the position of the Great Manual will determine the position of the other manuals.
11. That it is undesirable to alter the relative positions of the several manual key-boards as commonly found in English organs, viz., Swell above the Great, Choir below the Great, Solo above the Swell.
12. That the compass of the manuals shall be from CC to G in alt *at least—i.e.*, not less than 56 notes.
13. That the length of manual natural keys be five and a half inches, and the amount of over-lapping of the upper manual keyboards be one and a half inches.
14. That the height from the upper surface of the natural keys of one manual to that of the next manual above it do never exceed three inches.
15. That the position of the Great Organ draw-stops be on the right-hand side of the performer.
16. That the position of the Swell Organ draw-stops be on the left-hand side of the performer.
17. That the position of the Choir Organ draw-stops be on the right-hand side of the performer.
18. That the position of the Solo Organ draw-stops be on the right-hand side of the performer.
19. That the position of the Pedal Organ draw-stops be on the left-hand side of the performer.

CONFERENCE ON ORGAN CONSTRUCTION. 233

20. That the position of the draw-stops of the couplers be on the left-hand side of the performer.
21. That the several groups of draw-stops be placed in following relative positions :—

(*Left-hand side.*)

(*Right-hand side.*)

Swell Organ.

Solo Organ.

Pedal Organ.

Great Organ.

Couplers.

Choir Organ.

22. That the Swell Pedal shall project from the front panel, over the upper E and F of the pedal-board.
23. That the Swell Pedal shall be locked down by a swinging rod, and that it be liberated by moving the rod from left to right.
24. That the order of Composition Pedals, Ventials, Thumb Pistons, or other mechanical means of combination, from *piano* to *forte*, be in all cases from left to right; and that the various sets shall be distinctly grouped.
25. That the several groups of Composition Pedals stand in the following order from left to right from the front panel :— Pedal Organ, Swell Organ, Great Organ. But if pedals are applied to the couplers that they be placed between the Swell and Great Compositions; and that if Composition Pedals are applied to the Choir and Solo Organs, that they project from the right jamb.

RECOMMENDATIONS.

1. That the consideration of Organ Builders be directed to the widely expressed desire for some means of operating on the swell in addition to the ordinary Swell Pedal.
2. That there should be some contrivance to fix the Swell Pedal at any point of its descent at the will of the performer.

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3. That some plan be devised to bring the Swell Shutters into operation more gradually, so as to place the *crescendo* and *decrescendo* perfectly under the control of the performer.
 4. That the Composition Pedals affecting the Great Organ include proportionate combinations of the Pedal Organ; but that a ventril be provided to shut off the Pedal Organ to a soft 16 feet tone, by draw-stop and double-action pedal.
 5. That the more important and commonly used Couplers should be acted upon by pedals as well as by draw-stops.
 6. That the Great to Pedal Coupler have a draw-stop knob both on left and right-hand sides of the manuals.
 7. That the draw-stops project from perpendicular jambs.
 8. That in the case of large organs, the draw-stop jambs be placed obliquely.
 9. That no key-slip be placed between the different manual key-boards.
 10. That the short keys of the pedals be either lengthened, or raised at the back, in such a way as to assist in the cultivation of a more *legato* style of pedalling.
 11. That the consideration of Organ Builders be directed to the desirability of securing all centre-pins in the various actions.
 12. That the attention of those engaged in the preparation of organ specifications, be directed to the desirability of including 16, 8, and 4 feet pedal organ stops, of characteristic qualities of tone, suitable for melodic use.
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[Inserted by kind permission of the Council of The Royal
College of Organists.]

REPORT OF THE COMMITTEE

FOR ARCHITECTURAL ARRANGEMENTS AFFECTING MUSICAL REQUIREMENTS IN CHURCHES.*

THE general provision for the musical arrangements in modern churches has been acknowledged to be unsatisfactory, and the many points upon which there are conflicting opinions or increasing doubts have made it desirable that some definite principles and practical suggestions should be formulated by those competent to deal with the subject.

With this purpose in view, the Council of the College of Organists, as a consequence of Mr. J. Belcher's excellent Paper on the subject of "Musical Requirements in Church Planning," read† before the Royal Institute of British Architects, proposed to the Council of that Body that a Committee should be jointly nominated by their respective Councils to inquire into and consider the improvements and developments which might be adopted in the future.

The Council of the College of Organists nominated on their part certain Fellows of their College, viz. : Dr. Martin, of St. Paul's Cathedral ; Sir Walter Parratt, of St. George's Chapel, Windsor ; Mr. James Higgs ; and Dr. Turpin. The Council of the Royal Institute of British Architects nominated on their part certain Fellows of their Institute, viz. :

* This Report was submitted to the Council on the 4th May, 1891, and ordered to be published in *The R.I.B.A. Journal* [Vol. VII. p. 325], prior to its consideration by them. It was also published in the proceedings of The Royal College of Organists.

† TRANSACTIONS, Vol. V. N.S., pp. 33—52.

Messrs. J. Belcher, R. H. Carpenter, J. D. Sedding, H. Stannus, and H. H. Statham.

The Committee added to their number Mr. Somers Clarke, Dr. F. E. Gladstone, and Rev. W. Russell, Succentor of St. Paul's Cathedral, as authorities on many points of importance.

The Committee have also had the advantage of a conference with Mr. Micklethwaite and Mr. St. John Hope.

After a careful review of the arrangements which are now usually made for the accommodation of the choir and organ, the Committee desire to record the following observations:—

- (a) That the arrangements are generally defective.
- (b) That there is much misconception as to the best positions for the choir and organ in their relation to each other and the congregation.
- (c) That the space allowed for the modern organ is often insufficient.
- (d) That on musical grounds the old position at the west end for both organ and choir is, in general, the best.
- (e) That although for ritual purposes (following the ancient English Cathedral and Collegiate arrangements) a vested choir is placed in the chancel, yet, that where there is a chancel arch, central lantern, or transepts, the sound becomes intercepted instead of passing into the body of the church: moreover, where the chancel is narrow, antiphonal singing cannot produce its proper effects.
- (f) That when the placing of the choir in the chancel (according to recent custom) has involved the removal of the organ also, it has usually resulted in cramping the organ within some confined space, or "chamber," by which the tone has been damaged, and its beautiful qualities and real efficiency impaired.
- (g) That the arrangement alluded to above is not the most advantageous for the support and encouragement of congregational singing.
- (h) That these defects are more or less the result of adapting new customs and requirements to *old* buildings, and are not always to be avoided.

(i) That, as a result of the general improvement in knowledge and taste, the increased facilities for the musical rendering of the services, and the more frequent bringing together of large bodies of singers and instrumentalists, the provision of better accommodation for them is a problem which must be considered.

AS TO NEW CHURCHES.

The main object of this Committee is to promote the improvement and development of the arrangements of *new* churches, and they have taken as their basis the musical requirements of a large town church; these requirements would necessarily be modified for small town or country churches.

There would appear to be but five positions in which the choir can be conveniently placed in a church:

(1) At the west end of the nave.

It is commonly admitted by musicians that the most effective position for the organ is at the west end; but this position is not always advisable, if the choir be retained in the chancel.

(2) In galleries facing each other in the nave.

The advantages claimed for seating the choir in galleries (similar to the ancient "minstrel galleries") on the north and south sides of the nave are as follows: (a) the better support of congregational singing; and (b) the opportunities afforded for antiphonal effects.*

(3) Immediately outside the chancel screen.

(4) In the chancel aisles.

(5) In the chancel.

With regard to these latter positions, it is advisable, in planning a new building, in order to obtain the openness and space requisite for the sound to reach all parts of the building, that a "chancel arch" should be avoided, and the choir thus placed under the same roof as the congregation. This will enable the clergy as well as the choir to be properly heard.

* All "galleries" are subject to special conditions.

In churches exceeding 150 feet in internal length the plan of placing the main choir at the west end, and a "ritual choir" in the chancel, may be adopted.

AS TO EXISTING MODERN AND ANCIENT CHURCHES.

In dealing with existing churches, whether ancient or modern, the principles set forth in the "Recommendations" should, as far as possible, be observed; but each case should be individually considered. In those places (for example) where there remain a western organ and gallery of interest, at a distance of not more than fifty feet from the choir seats in the chancel, it is desirable that such should be retained *in situ* and used; and where the distance is more than fifty feet, a small additional eastern organ to support the choir is recommended.

In buildings lacking adequate height, a position should be chosen for the organ which will give the best available space for sound to develop itself above the pipes and to pass into the nave.

The Committee have carefully considered and have drawn up the principles of the subject before them, and have formulated the following "Recommendations," which have been agreed to by every member.

RECOMMENDATIONS.

No. 1. That the organ and the choir be so placed in the church that they may most effectually assist in the services.

No. 2. That it is essential to acoustic success that in the erection of new churches ample height should be provided for.

No. 3. That in arranging any position for the organ, ample space should be allowed as regards area, "speaking-room," and height.

No. 4. That no "open-flue" pipe should have less than its own speaking length (the speaking length of an "open-flue" pipe is the length from the slit or mouth above the conical foot up to the top of the pipe) above it.

No. 5. That the organ should be concentrated, and not divided in two or more parts at a distance (excepting to place the choir organ in advance of the main instrument in the architectural design of the case).

No. 6. That the ground space to be provided for an organ, exclusive of engines employed as blowing apparatus, should not be less than 600 superficial feet for an organ of 60 stops, of 310 superficial feet for an organ of 40 stops, and of 180 superficial feet for an organ of 20 stops.

No. 7. That the organ should never be placed in a "chamber," but that the best position for an organ is that which has a sufficiency of open space above it and on three sides, and a solid unpierced wall at the back.

No. 8. That the term "organ place" be adopted, because it is more comprehensive (including gallery, &c.), and because the term "organ chamber" is misleading, inasmuch as a chamber (or enclosed place) has been determined to be *not* suitable for an organ.

No. 9. That the internal surface of the roof above the organ should not be of wood, but of stone, plaster, or other non-absorbent material.

No. 10. That in order to avoid noise and economise space, the organ "feeders" should be placed at some convenient distance from the organ, and outside the main body of the building.

No. 11. That the air supplied to the "feeders" must be derived directly from the church itself, in order to obtain the same temperature.

No. 12. That the organ should be placed at a short distance from the choir, and that the best distance is about twenty feet.

No. 13. That the organ should never be placed between the choir and congregation.

No. 14. That the sound of the organ should not have to pass over one half of the choir to reach the other.

No. 15. That when possible the organ should be equidistant from both halves of the choir.

No. 16. That the choir be placed on raised floors, or in low, projecting galleries architecturally treated.

No. 17. That the height of the platform, steps, or gallery on which the choir is placed should be regulated by the length of the church.

No. 18. That provision should be made for the accommodation of large bodies of voices for special occasions to be seated in due musical relation to the choir and organ.

No. 19. That it is desirable, in churches of adequate size, that provision should be made for an orchestra on special occasions.

No. 20. That the orchestra should be in the organ gallery, in front of the organ, or in some similar and approximate position.

The Committee, in framing the foregoing "Recommendations" for the guidance of those about to erect large churches, have made them as general and as wide as possible, that the same principles may be followed in the erection of small churches or alterations of ancient ones.

(Signed) F. E. GLADSTONE, GEORGE C. MARTIN,
WALTER PARRATT, JAMES HIGGS, E. H.
TURPIN, W. RUSSELL, JOHN BELCHER,
R. HERBERT CARPENTER, SOMERS
CLARKE, J. D. SEDDING, HUGH STANNUS,
H. H. STATHAM.

ELECTRIC & PNEUMATIC ACTIONS.

Acting upon a valuable suggestion, the following contributions upon Electro-pneumatic and Tubular-pneumatic Actions are here given, for which the writer wishes to express to each contributor his sincere thanks.

[COPY].

Telegraphic Address :
"BASSOONIST," LONDON.

WM. HILL AND SON,
ORGAN BUILDERS.

YORK ROAD WORKS,

Camden Road, Islington, N.,

London, April 23, 1894.

Dear Sir,

It is difficult for us to describe in words our Electric system of action. As a matter of fact there is a great deal of value attached by some to electricity as applied to organ building which it does not possess. Tubular pneumatic action has now been brought to such perfection that we can make the most perfect repetition through a tube approaching 100 feet in length, a distance which covers practically the utmost limit of distance ever required or desirable between keyboards and organ.

The essential part of an electric organ is, after all, the pneumatic arrangement attached to the Soundboards, which is actuated by the Electro magnet. But as you can get this pneumatic to act practically as rapidly and satisfactorily by means of a tube as by a wire and Electro-magnet, the advantages of Electric action become greatly diminished.

The chief advantage lies in the convenience of a cable as compared with a system of tubes, while, *per contra*, you have the chances of failure of electric contact in the various

movements, the maintenance of current, and the various little troubles which beset every form of Electric action, and which are almost entirely absent in tubular pneumatic.

We use electricity only where circumstances of site are so awkward that tubular action cannot be applied except, perhaps, at great expense. (Ordinary electric action costs as much as, or more than, tubular.)

We have built large 4-manual electric organs at Kensington Parish Church, and Wesleyan Chapel, Mornington Road, Southport, and smaller ones elsewhere. The arrangements of the consoles are, in appearance, similar to the best pneumatic organs, except that the keys, when coupled, do not fall. We use a peculiar form of Magnet with hanging armature, and prefer current derived from small dynamo, and driven by a turbine at little cost. Accumulators are used. Every known form of primary battery is troublesome and must be constantly renewed. The rapidity and trustworthiness of our action we consider equal to anything yet achieved in electric organs.

Faithfully yours,

Wm. HILL & SON.

[COPY.]

ORGAN MANUFACTORY,

LEWIS & COMPANY,
LIMITED.

Shepherd's Lane, Brixton,

April 23rd, 1894.

Dear Sir,

In answer to your letter of the 19th inst., we beg to say that our system of Electric Pneumatic Organ building is reliable; but we believe that everybody else either thinks or says the same of theirs. We will give you our latest experience.

In the Church of St. Botolph's, Bishopsgate Street, we took the Organ down, cut it in half and placed it on each side of the West Window; on the South Side we placed the

Great, Choir, and half of the Pedal Organ, with its original action; on the North side we placed the Swell and the other half of the Pedal Organ, and fitted it with our Electric Pneumatic Action. It was finished at Whitsuntide last year, and has gone perfectly ever since, on three Le Clanché cells (Post Office pattern).

The tracker work on the South side wants constant attention, but the Electric Pneumatic Action has not required any attention since last Whitsuntide. We have also lately re-built the Organ in St. John's Church, Wilton Road, 3 Manuals, and about 50 Stops; this has now been finished about three months, and is going on 3 Le Clanché cells (Post Office pattern).

It is absolutely impossible for any other system to give similar results, for the simple reason that the resistance in our magnets is ten times greater than those used by anyone else.

Yours faithfully,

LEWIS & Co.

From Lewis & Co's. Circular.

ELECTRIC AND PNEUMATIC ACTION.

LEWIS'S NEW SYSTEM OF ORGAN BUILDING.—This system allows:—The several sound-boards of an Organ to be located separately, without difficulty:—the position for the Keys to be chosen with regard to light, and to convenience and comfort in playing;—also the playing of the Organ from two or more Consoles in different positions in a church or dwelling.

LEWIS'S New System of Electric and Pneumatic Action for Organs takes its stand on the guarantee that it is free from the disabilities and objections connected with the Electric methods of the past. The use of Electric action in Organs has been hindered by the fact of the systems hitherto applied failing to satisfy Organists. The known defective examples have naturally given rise to great distrust of the utility of Electricity for the purposes of the

Instrument. Even for large Organs, where most it should have been made available, the first cost has been disproportionately great, and the expense of keeping in order, with the constant trouble of freeing the points from the deposits of corrosion, consequent upon the strong battery power necessary, a further drawback; these disadvantages alone have been a barrier against a wider adoption of such systems;—add thereto the Organist's troubles, the uncertainty of the strength of the magnets, the frequent failure of repetition at the keys and pipes when called upon in full Organ play, or, worst of all, the discomfiture of the player when draw stops intended to act by Electricity capriciously refuse to answer, powerless, however strong the battery, to throw the slides on or off; and it is not difficult to understand that Organists have preferred to dispense with a treacherous aid, and have looked upon Electric action as almost restricted to the simple requirements of an echo-organ placed in a distant position.

The new system devised by MR. LEWIS does not depend on strong battery power and the use of large magnets; it works with the lowest power, a few cells only, for Organs with sound-boards of the largest size. For some years past MR. LEWIS has used a system of Pneumatics distinctly his own, as exemplified in large Organs erected by him in St. Andrew's Hall, Glasgow; the Cathedrals of Ripon and Newcastle; and in other large Churches in Town and Country. This system, wholly satisfactory in itself, formerly actuated on the tubular method, can now be, wherever so chosen, combined with Electric action as the motive-power connecting the key-boards and pedale with the sound-boards of the Organ. It matters not how large the Organ may be, whether of two manuals or five manuals, or with greater or less number of stops, the battery power will be the same; additional stops will need but little more power, the whole is worked by a simple Le Clanché battery (Post Office pattern), which is well known by electricians to be not only the best but by far the most lasting, and, in fact, the only one to be relied upon. The battery power used is not the one-twentieth part of that formerly needed.

The Console of such an Organ stands by itself in any chosen place, position and distance being immaterial, occupying a space which for an Organ of forty stops need not exceed 4 feet by 3 feet, and containing within itself the whole of the action connecting the manuals and pedals, draw-stops, couplers, pedal and combination levers and couplers, with the Organ. The key action is as light and elastic as that of a pianoforte, and perfect in repetition everywhere; the key level never alters, nor does the touch vary in resistance, both remain the same with full Organ in play, as with a solo stop.

From the Console the player, sitting with the singers, or in any desirable position in the Choir or Chancel, would be able to command the working of the whole of the largest Organ situated afar at the western end of the nave, would draw each stop in complete reliance on the slides of the sound-board fulfilling their office, promptly moving in or out, although with no other means of communication than a small cable of a few dozen strands of copper wire, electricity alone working every change; and—marvel of it all—the player, using the swell pedal in his ordinary manner, would obtain crescendo and diminuendo with a more perfect effect than by the old way; the swell pedal he can alter and adjust to any degree of resistance suited to himself, yet far away the shutters of the swell open and close to the gentle strength of an invisible power, not at all in relation to his own strength, but obeying only his intention. With the last important invention the Electric Organ is rendered complete as it never has been before; several differently situated swells may be worked at the same time by the same movement without any greater effort. The system thus complete allows of an Organ of several sound-boards being set out in ways conforming to convenience, and suitable to any desired effects; the restraints of mechanical needs no longer determine the distribution of parts; the connection of the whole in one structure is optional, because the hosts of trackers and rods, roller boards, stop-rods, back-falls, and squares, in intricate relation all more or less influenced by changes of

weather, are dispensed with ; nothing is cramped to suit the necessities of right-angled work, since the cable will go round corners, up staircases, and into galleries wherever the parts of the Organ are located. How much such advantages will add to the enjoyment of the best effects of Organs both in Churches and Mansions will soon be perceived, and their possession desired by Organists and Musicians ; not the least of these being the freedom from the enforced cooped up position close under the Organ to which the Organist has been so generally condemned, where he can neither distinguish the voices of the choir, nor hear what the instrument he has under his hands is producing ; it is well known that in the majority of instances the Organist goes through his part mechanically, arranges his stops on the supposition of effects of which he cannot possibly judge, trusting to chance that they will be right. With an Organ on the New System the player may sit with his choir, facing them, actively alive to every passing need, helping the voices as his skill may determine, and having the satisfaction which, wherever such an arrangement is possible, an Organist ought to have as a right connected with his responsibility, that of hearing the real effects in the building of the musical resources of the instrument intrusted to his judgment.—*May, 1881.*

The Organ in the Church of St. John the Evangelist, Upper Norwood, has Three Manuals and Pedale, and Forty Draw-stops. It was the first erected with Lewis's new electric and pneumatic action. The keys and pedals actuate the valves in the sound-boards of the Organ from the console, which is placed on the opposite side of the chancel, making a traversing distance requiring wires 175 feet in length through which the electric impulse is conveyed to and from each key.

LEWIS'S KEY-TOUCHES FOR COMBINING ORGAN STOPS AND COUPLERS.

The Key-touches, nine or ten in number to each Manual, are incorporated in the structure of the key-board, and are so placed as to occupy positions in the central range of

the player for either hand, each little key being inserted midway between two naturals or two sharps, being to all appearance an intervening sharp, somewhat higher but much shorter than the regular sharp, but so arranged as not to interfere with the accustomed methods and practice of fingering. Each Key-touch is placed in connection with a light pneumatic valve, working some arranged combination of drawstops and couplers; actuated by the slightest touch of a finger, the whole combination answering either Key-touch shows itself upon the face of the stopboards, telling the Organist exactly what change has been effected.

The rapidity of movement, the certainty of response, the noiseless action, and the perfect control over all combinations of stops, fulfil the best desire of the organist, and enable him to build up the tone of each Manual with an ease never before experienced; the power of expression thus gained seems almost to confer upon the Great Organ the capabilities of the Swell, and at the same time to endow one Manual with the variety and change as of many Manuals.

In an Organ having these Key-touches, the rattling iron fan movements and composition pedals are unnecessary and obsolete. The modification in the construction of the keyboard is very simple, and does not in any way hinder the ready moveability of the keyboard-frame, there are no disconnections to make, no preparations to be troubled with, and therefore the practical utility of such a system can be clearly understood by every experienced Organist.

THE HOPE-JONES' ELECTRICAL SYSTEM.

The reader will doubtless expect some account of the latest development in organ building known as "The Hope-Jones' Electrical System," but considerably more space than is available would be required to deal fully with the details of this system, which embraces many novelties both in tone and mechanism. The most prominent features from the Organist's point of view are undoubtedly

the moveable Console, the Stop-keys instead of Draw-knobs, and the Second touch; whilst the advantages that will most appeal to the Architect and the Organ builder are the ability to place component parts of the instrument wherever art or acoustics suggest, the reduction of mechanism to a minimum, the perfect response and repetition, and the minute quantity of electricity required.

This system, like all novelties, has had to meet much opposition, but that it is making its way is attested by the interest shewn in MR. HOPE-JONES' pioneer Instrument, recently erected in S. John's Church, Birkenhead, which has been visited by some three thousand Organists; and by the fact that a large works employing a hundred men is now firmly established in the same town.

*Extract from a letter from Mr. R. Hope-Jones,
dated April 21, 1894.*

"In reply to your questions as to reliability we would say that the Hope-Jones Electric Action *as made by us* is certainly simpler and more reliable than ordinary tracker work, though we cannot say as much for the attempts made by Licensees before the establishment of the Factory. With every instrument we put up we offer to bind ourselves under guarantee to keep it in perfect working order for any term of years up to, and including thirty."

NEW METHOD OF PRODUCING MUSICAL TONE.

*Extract from a letter from the Hope-Jones Electric Organ Co.,
Limited, Argyle Street, Birkenhead, December, 1894.
(Now of 4, Berners Street, London, W.)*

"It occurs to us that you may like to know of an entirely new method of producing musical tone recently invented by our Mr. Hope-Jones. The apparatus, which is in principle and effect unlike either flue or reed pipes, produces tones resembling either a peculiarly full and fluty Diapason, a firm Horn Diapason, a species of large Tuba, or a smooth Trombone, according to the pattern of its make. Variations in temperature cause no trouble with regard to pitch, as the new tone-producers follow the flue work of

the organ under all circumstances. The tones, even when a light pressure is used, are of enormous strength, and quite throw into the shade all reed and flue pipes, even those of our Tibia Plena, Tibia Profunda, Diapason Phonon, Tuba Sonora, Tuba Profunda, &c. This power may be modified, without materially affecting the pitch or quality of the sound, by altering the wind-pressure, as in the harmonium. A pedal to control the pressure is provided at the console, and a new and startling means of expression is thus given to the organist. Some of these stops (one of 32-ft. pitch) will be placed in the new organ we are building for Worcester Cathedral.

J. J. BINN'S PATENT ELECTRICAL ACTION.

From Circular.

In a great measure owing to the indifferent knowledge of the nature and qualities of Electricity, the early attempts to apply this power as a substitute for the ordinary mechanical action were far from satisfactory. They, however, served as a basis for the experiments which have been conducted with increasing success by various Organ Builders and Electricians since Dr. Gauntlett first applied his Electro Magnets in 1845. It cannot be denied that for large instruments, and in particular where they are divided, and the departments, Great, Swell, Solo, Choir or Echo are placed in positions widely apart, that no means of placing these under the control of one performer from one console can at all approach in completeness the Electric Action.

Our method of applying this, however, differs in essential particulars from other forms. We use the electric fluid solely as a transmitting medium, controlling extremely small valves in response to the action of the keys. These valves call into play pneumatic power, on which alone rests the heavier labour of overcoming the resistance of the pallet. When applied in this way, all necessity for a high current of Electricity is avoided. Quite 99 % of the power required in other applications of Electricity is saved in this

one. The valve has but a movement of $\frac{1}{4}$ th of an inch, and an extremely slight impulse is sufficient to effect it. So little Electricity is used, and none whatever except at the moment of moving stop or key, that its maintenance involves no greater expense than the ordinary action. A small dry cell battery will supply all the power needed for several months, it takes up but a few inches of space, and can be replaced when exhausted (at a very trifling cost) by any intelligent person. A flexible cable, not more than an inch in diameter, is all that connects the console with the Organ. This cable can be of any length, allowing the console to be moved a distance from the Organ, or in any other position most suitable for recital, choir practice, or service accompaniment.

This Electric Action enables us to separate the various departments of the Organ as far apart as may be desired, and still to have perfectly concurrent speech when all the divisions are coupled together. A celebrated Electrician has been engaged to superintend this department, and perfect success is guaranteed.

BINN'S PATENT TUBULAR PNEUMATIC ACTION.

Notwithstanding the vast improvements in the tracker action since 1860, when, according to Sir George Grove, a pressure of 25lbs. was required to depress a middle C key, the advanced style of Organ playing in vogue now, demands, even with the addition of couplers, a lightness of touch which the tracker action can never be made capable of, apart from its inherent liability to get out of order. Profiting by the attempts made during the past thirty years, to provide some mechanical method of effecting the connection between key-board and pipe, we have patented a system of Tubular Pneumatic Action which effects the purpose without complication, and with absolute success.

The features of our inventions are, that no high pressure wind is required; the action being worked with wind taken from the reservoirs which supply the pipes. There is very little mechanism to get out of order, all trackers, squares,

wires, &c., are swept away. It lends itself to a far more compact arrangement of the Organ. It would be impossible to build some of our Organs with the ordinary tracker action. It facilitates the multiplication of couplers, the octave or sub-octave on one manual or to another. It remains equally effective under all climatic variations.

The action of the key is to open a valve at its anterior end; this is all the labour required, the rest being accomplished entirely by the pneumatic action. The opening of the key valve admits a very small quantity of compressed air into the metallic tube; this, at precisely the same time, pushes forward the column of air in the tube, a distance less than half-an-inch is travelled, but this is sufficient to open the valve at the soundboard end of the tube, and this by another piece of mechanism is made to admit full wind to the pipe.

The small quantity of wind, and the short distance it has to travel, makes our action one of the most perfect in existence. The touch is of extreme lightness, the repetition is such that the pipes respond to the most rapid staccato passages, whilst the least depression of the key produces full speech. The movements of the valves do not make the slightest noise.

This catalogue of advantages, together with the numerous Organs built on this principle, warrants us in believing that where difficult positions are alone possible, or where a separate keyboard is desired, this patent stands pre-eminent. Unlike many others, it has the merit of having been tested, and the many examples to be found in all parts of the country, prove our assertion that it will work accurately without requiring any attention for years, which is utterly out of the question with any other action.

Our Electric Pneumatic Patent is a variation of the one just described, the principles of action at the soundboard being the same. The intervening medium is electricity instead of compressed air.

We would also call attention to our Patent Automatic Interchangeable Combination Pedal.

CASSON'S "POSITIVE" ORGAN.

Kindly contributed by Mr. Thomas Casson, 8a, Berkley Road, Chalk Farm.

Casson's "Positive" Organ is a small instrument for Country and Mission Churches. Its compass is from FF (6ft.) to C². A pedal effect is obtained in very accurate and effective form by the "Double Bass" stop on the keyboard from FF to mid C, *only the lower note struck* sounding. The effect of a second manual is obtained by the "Melodic" stop, which on the selected stop sounds only the highest note struck, and if used with a softer stop played in harmony, asserts the melody. There is also a transposing arrangement. Very modest skill enables the player to render music with fine effect, and the "Positive" is well adapted for Colonial Churches or other places where a skilled pedallist cannot be expected.

These organs are built by The Positive Organ Co., Ltd., 8a, Berkley Road, Chalk Farm.

CASSON'S SYSTEM OF ORGAN BUILDING.

Casson's System for larger Organs has but little in common with the "Positive," it is applicable to all classes of action. Its main features were brought out by 1884, to obtain increased resources, economy of room and money, simplification of mechanism and manipulation, and systematisation of controlling accessories.

Increased resources are obtained by "octave duplication." This is a purely combinational movement, not to be confounded with "borrowing" or (as it is the fashion to call it) "transmission." The stops of a duplicated manual are furnished with an octave coupler and an extra octave of pipes, &c., to complete it. There are two sets of draw-stops; the first acts in the ordinary way, but is thrown out of gear on touching a stud called a "Manual Help." At the same time the second group comes into gear *in conjunction with the octave action only*, so that 16ft. stops

become 8ft. and so on. The couplers *grouped and controlled as stops of the division which they augment*, (a fashion introduced by Casson in 1882,) are also duplicated. In this way, the Great manual is instantly turned into a Choir organ, the Swell into an Echo, or *vice versa*, as is best seen on examining the typical specification given.

Great economy results, without loss of efficiency, by the peculiar treatment of Pedal stops by borrowing in the manner described. This was vehemently condemned by organ builders on its inception in 1882, but now very generally adopted.

A valuable resource is the Melodic treatment of the Solo organ, based on Dawes's "Melody attachment" for the harmonium. On touching the "Melody Stud" all the Solo organ is silenced *except the top note struck*. If the Solo in this condition be coupled to another manual it will of itself follow the melody of any harmony played on that other manual. The invention is sometimes used for coupling only, as *e.g.*, "Solo Melody to Great."

Reform of the brutal and monotonous English Pedal organ is however Casson's greatest achievement; extending not only to the provision of proper basses—including pedal stops for the Swell inside the swell box—but to its complete control. This is effected by the "Pedal Help," a bar at the back of each manual. On touching any one the drawstops (or stop keys) of the Pedal stops and couplers at once group themselves into the proper bass for the combination of stops *and couplers* extant upon its manual. The pedal draws then continue to follow all the changes on that manual until the "Pedal Help" of another manual is touched, when they conform to and follow that. Thus, save for special effects, the drawstops for the pedal and its couplers need never be looked at or thought of. It is the inventor's contention that if rid of the worry of drudging manipulation of the pedal organ and couplers, the organist requires very little assistance in combination movements for the manuals, especially as "duplication" places a great number of such combinations always under his hand. These being prepared beforehand or during playing are switched on by the "Manual Helps" or stop switches as

some call them. Mr. Casson patented them in electro pneumatic form in 1889. Thus simplification and systematisation are attained.

These four matters, Octave Duplication, proper Pedal Basses, Melodic Solo and Pedal Help, are the chief features of the System. There are minor details, such as the "vibrato," (1889,) an improved tremulant, silent and certain, varying its speed with the position of the Swell shutters. A "Compound Swell Pedal" which easily controls two swells independently with one foot, &c.

DESIGN FOR A CASSON ORGAN.

3 Manuals, 19 Manual and 6 Pedal Stops, 8 Coupling Actions.

1st Manual, Great and Choir.
2nd Manual, Swell and Echo.
3rd Manual, Solo.

GREAT.

1	Contra Salicional (ten. C)	<i>ft.</i> 16=
2	Lieblich Bourdon	16=
3	Open Diapason	8
4	Suabe Flute	8=
5	Principal	4
6	Fl. Traverso	4=
7	Mixture	IV.

I. Octave Coupler.
II. Second Manual.
III. Third Manual.

Two Comp. Peds.
Cresc. Full Organ Ped.
Manual Help (to attach Great
and detach Choir).

CHOIR.

1	Salicional	<i>ft.</i> 8
2	Lieblich Gedeckt	8
4	Suabe Flute	4
6	Piccolo	2

II. Second Manual.
III. Third Manual.

Manual Help (to attach Choir
and detach Great).

SWELL.

8	Rohr Bourdon	<i>ft.</i> 16=
9	Contra Viola (ten. C)	16=
11	Geigen Principal	8

ECHO.

8	Rohr Flöte	<i>ft.</i> 8
9	Viola d'Orchestra	8
10	Voix Célestes (independent)	8

SWELL—continued.

ECHO—continued.

12 Hohlflöte	<i>ft.</i> 8=12	Hohlflöte	<i>ft.</i> 4
13 Harmonic Flute	4=13	Har. Piccolo	2
14 Mixture, III.			
15 Double Hautboy	16=15	Hautboy	8
16 Cornopean	8		
IV. Octave Coupler.			
V. Third Manual		V. Third Manual.	

Two Comp. Peds.
Cresc. Full Organ Pedal.
Manual Help (to attach Swell
and detach Choir).

Vibrato.
Manual Help (to attach Echo
and detach Swell).

SOLO.

17 Harmonic Flute	..	..	..	<i>ft.</i> 8
18 Corno di Bassetto (in separate Swell)	..	..	..	8
19 Tuba..	..	..	..	8
Harmony Stud.			Melody Stud.	

PEDAL.

20 Acoustic, <i>i.e.</i> , 12 notes, Quint, remainder in 32ft. actual pitch from No. 2	..	..	..	<i>ft.</i> 32 result.	<i>pipes</i> 12
21 Echo Sub-bass (in Sw., from No. 8)	..	..	..	16	0
22 Open Diapason..	..	..	..	16	42
23 Geigen Principal (in Sw., 18 from No. 11)	..	..	..	16	12
24 Flute (18 from No. 6)	..	..	..	8	12
25 Principal (from No. 22)	..	..	..	8	0

VI. First Manual. VII. Second Manual.
VIII. Third Manual.

Three Pedal Helps.

(All couplers being grouped with their departments, it is not necessary to quote the augmented department on the coupler labels).

NOVEL SYSTEM OF ORGAN BUILDING BY

MR. J. T. AUSTIN, JUN., OF DETROIT, U.S.A.

Contributed by Mr. J. Austin, Knuston Lodge, Wellingborough.

From the earliest times human ears have listened with pleasure to sounds produced by regular vibrations, which are properly described as musical, in contradistinction to those which are not so, and therefore known by the name of noises. A musical note is not only regular in its vibrations, but these are continuously generated by the same cause; and this very condition preserves its uniform quality throughout. These sounds, to form a musical scale and to be fitting for musical purposes, should be in proper proportion both in volume and quality from the lowest to the highest note. An organ is not only able to produce a note for each manual key, but a number of sounds in combination according as it is controlled by the performer. This number of sounds (be they few or ever so many) should be smooth and truly in tune, and exactly the same as when each single note was adjusted. If they are not so, what becomes of the result of the tuner's care if this instrument fails when tested to its full chorus power? It would be very difficult to convince by mere words those who believe in the excellence of the system which up to the present time has been in use. They may think that the ultimatum of perfection has been reached and no further improvement is necessary, or, if there are any faults, they are so small that they are not worthy of notice. But if these persons were to put pressure gauges on different parts of their *best constructed organs* when played upon up to their *loudest capabilities*, they would be surprised to see the antics which these wind gauges would make. This takes place, then, when the greatest amount of wind is needed. Why is a single stop so smooth? Because the demand for wind is so small, and every stop has been voiced and tuned under the condition of the bellows being inflated and almost in a state of rest.

To explain what otherwise happens we will suppose the bellows reservoir board to be 6ft. by 6ft.; this, needing a weight of 7lb. per square foot, amounts to $2\frac{1}{2}$ cwt. It is foolish to suppose that this heavy weight can be divested of its natural law of inertia and momentum. Imagine now the bellows to be fully inflated and in a state of rest—all is right—equal pressure everywhere. Now suddenly strike full chords with every stop and coupler out and heavy pedal notes added; these heavy weights on upper board constructed to rise and fall, to take in, and give out any displacement, lag behind at first, obeying the law of inertia: this results in less pressure; but when it has started in its descent it obeys the law of momentum; and it may be that this sudden demand of wind is no longer needed. This suddenly checks its downward course, and is the cause of momentum being added to weight. The result then will be more pressure. Also the intermittent thrusts of wind from the feeders, whose duty it is to keep up supply, have an equally disturbing influence from exactly the same cause. This evil has been recognised, and in a small measure relieved by the contrivance of a separate storage of pressure for the manual stops, reserving the first bellows for the larger pedal pipes. Also spring concussions have been applied to trunks and connections. These have been steps in the right direction, but not a total remedy.

There is also another failing which is inseparable from the present system as carried out by means of chests, trunks, wind grooves, and tubes, more or less contracted and lengthy, known by the name of robbing, which may be explained to be the inducement of air currents of varying velocity, which are caused by large or small demand of compressed air. Wherever there is a current of air the pressure or density must be greater where this current starts than to where it is flowing, the same as a current of water proves that it is flowing from a higher to a lower level. Therefore, when extra wind is needed to supply a larger number of pipes and the supply is through grooves of comparatively small sectional area the pressure is lessened, or, it what is called, robs; but when fewer stops are used, or it may be only one, the wind supply is ample,

and no robbing exists. It is, therefore, impossible for pipes to sound their true pitch and note when subject to these variations.

To utterly sweep away all these defects an entirely new system has been devised, which also possesses many other advantages. This new system has passed its experimental stage, and three organs of considerable size have now been constructed. The last one has been built specially for the new Polish Catholic Cathedral Church in Detroit, U.S.A. The success of this new system has been pronounced by all organists and persons able to judge who have tested and tried these organs. Patents have been granted under the name of "The Universal Wind Chest Pipe Organ." The principle is, air under pressure in large volume, and not in limited quantity; this last organ has been constructed to hold in its reservoir chest 1,800 cubic feet, having all its mechanism *inside*, and also forming the building frame. The bellows feeders are on the exhaust principle, that is, they pull in air from the outside, therefore have the pressure on the outside of ribs; no wood is necessary for them, for the pressure is a *blow in*, and not out, as in ordinary construction. They work vertically on one side of this chamber, as also does the displacement board on the opposite side, which is constructed to *pull in*, giving the needful pressure. The mechanism for giving wind to all pipes and control of stops is arranged on the underneath side of the flat roof of this chest, all pipes pedaling on its upper and outer side, except larger and pedal pipes, which stand at a lower level. An air-tight door gives admittance (except in organs of very small size) into this pressure chamber, where one or more persons can observe the whole mechanism in action during any musical performance or otherwise. All valves of bellows and pipes, and other mechanisms are within easy reach, and can be handled and, if need be, adjusted, at no cost or trouble, and without removing a single screw. The absorbing and annihilating effect of this large capacity of compressed air is such that all unsteadiness or irregularities of pressure are radically cured and done away with; nor is there, when the loudest combinations of stops and couplers are drawn,

demanding the greatest supply of wind, any current of air perceptible. The manual stops are all fitted to stand on pipe bars made to template, complete in themselves, and interchangeable. These, with their separate valve for each pipe, hang into the air space without the aid of trunks or any wind connections, giving a wind supply which *can never be reduced*. The pneumatics have all the pressure on the back, without tubes or any connections, therefore are instantaneous in their action, for pneumatics will be sluggish from want of prompt pressure. This arrangement will give a repeat of full chords as quickly as a single note, so that a musical phrase will not suffer for want of crispness. The connection between each pipe and its valve is solid wood, with no joints, tortuous conveyances or grooving to break or leak.

Contrast this with two surfaces grooved with cuts for waste wind, to prevent running of wind from pipe to pipe, and sliders to work between—either too easy or too stiff, and this waste always varying according to dampness or dryness. This causes smaller pipes, especially, to go out of tune. The promptness of speech and purity of tone in these organs is due to the merits of this system, giving an imaginary connection between wind supply and demand, through space of a *sectional area* equal to the *surface measure* of the pressure board. To illustrate the power possessed by air in large volume of absorbing inequalities, observe the mode of blowing at an iron furnace, where intermittent thrusts of compressed air are forced into vast air-ways, resulting in a continuous blast at the nozzles. This alone is sufficient to prove that such ability exists. Electric action of low voltage is used in these organs in conjunction with pneumatics.

A good reliable pneumatic action has been devised, doing away with a separate wind pressure at the console, or keys. The couplers used in these organs, however numerous they may be, consist only of one row of pallets for each manual, and when opened exhaust into the *external air*: it is evident that these pallets can be made to fit perfectly air tight, and are superior to the system with sliders; they are also instantaneous in their action, and

have been tested in a most extreme case of 60ft. tube distance: 10ft. or 12ft. being the utmost limit of requirement in ordinary circumstances. The weights in other organs to give pressure of wind are entirely dispensed with in these; their place and function being exchanged for either a "vacuum pull," or springs, (compensated by one outward folding rib,) which have been found to work well and give no trouble, the pressure board responding so quickly to any displacement that it is possible to *wedge down every key* on the manual, and, by making and breaking contact of battery wire, every pipe will speak its true note and pitch, responding to a wind pressure which can never be either increased or reduced. The whole area of the pressure board is a *concussion* whose communication to each pipe is *unimpeded through air space of equal surface measure to itself*, and therefore *no air current* is perceptible.

Music demands, and always will require, transitions more or less sudden, from soft to loud, and *vice versa*; an organ therefore should, if perfectly constructed on a proper system, comply *unswervingly* to this demand, and not commence a loud staccato chord *flat* and *end* it sharp. Instrumental players, either singly or in combination, would never think of doing this; neither should a blower be *heard* in the *surging* of a long chord that ought to be steady, smooth, and perfectly in tune throughout. The wind being taken at the top of the air space there is no drifting dust to stop the speech of reeds, or cause them to go out of tune.

Also it gives facilities to add to, or alter an organ to suit a different position, or increase the number of stops, at less than one-fourth the cost and trouble necessary on the old system, with its backfalls which are *fanned* to suit a certain distance, and are useless for any other; roller boards, trackers and squares the same; the same may be said of trunks, wind-ways, and conveyances; also faults of sound boards are difficult to remedy without taking them all to pieces.

The dignity of an organ is, and ought to be, to give the component notes of a chord, be they discordant ones or

not, in their absolute purity; this is the only legitimate discord that is allowable, all else is unbearable to musical ears.

The console or manual keys, together with draw stops and pedals can be made moveable if electric, and be connected by a cable of insulated wires. A new invention to connect motion of swell pedal with swell shutters is electric also, and the motion of the one is the exact copy of the other. Also a new tremulant, which acts on two or three selected stops, and deals with the sound waves after they are made, and not a fluttering valve in a trunk, which does harm to the tone by disturbing the wind supply.

The evil of unequal pressure has been proved to exist first of all in the bellows, which ought, and are assumed to give, equal pressure. This will be admitted *not* to be the case; and the evil is increased by the transmission of this wind (as it is called) by means of lengthy, tortuous and inadequate wind trunks; further by insufficient storage under the pallets; too small channels in the soundboard, either vertically or horizontally; afterwards by insufficient windway in upper table of chest, sliders, and upper boards, and carried still further by too small conveyances to larger pipes when standing off their wind, either by grooving in the upper boards or tubing to front pipes; and, be it noted, these pipes are always the larger ones which need the most wind: all these are very serious faults. If this robbing of wind was always alike, and never varied under any circumstances, it would not so much matter, but it *does vary*, and can never be prevented on the old system.

Now there is a species of robbing which is perfectly legitimate, and is the only method of adjusting the power of a pipe, that is, by stopping off the wind at the foot in metal pipes, and by inserting small plugs in wooden ones; this allows the pressure to lessen by the wind expanding in the foot after admission, causing a less pressure at the windway where the sheet of wind escapes; and when this delicate operation is performed and gone through carefully, *nothing* should interfere afterwards. If any adverse conditions should afterwards exist, no matter from what cause, the *pitch* and *tone is injured*. Delicate stops, such as

Keraulophons, Dulcianas, and Harmonic Flutes, *will lose their note* as well as their pitch, and the larger pipes which are conveyanced or grooved off, together with the more robust stops, will follow in the same wrong path ; the result will be discord when this organ is played full.

The heavy bellows weights are not only wrong in principle as to pressure, but severely try, and damage the structure of the bellows. This system does not try bellows. If anything should get out of order it is localized to a particular part, and that fault can be dealt with without interfering with parts adjacent which are all right, and need no interference. Therefore no extra cost is incurred by unnecessary displacement of either pipes or mechanism ; and valves of feeders, excepting the inlet ones, all open inside, and are in view, and may be dealt with at once without trouble. The pressure board has no valves, and is *entirely distinct* from the bellows, or more properly, feeders. *No valves are needed*, its duty being to move *in* and *out* to increase and lessen capacity of air chest. The pipe valves may be lifted off their seats and replaced. The couplers may be numerous, and the weight of touch remains unaltered.

The new system supplies and meets every condition that is needed, resulting in grandeur and purity of tone when these organs are played full. The pressure-board being light it responds however great and sudden the demand, and stops without undue pressure at the closing end of the loudest chord.

The whole of the improvements embodied in these organs merits patronage, it being *the* system and the *only true system* of Organ Construction.

RUSHDEN CHAPEL ORGAN, NORTHAMPTON.

Specification of Organ built with the "Austin Universal Air Chest" and "Exhaust Tubular Pneumatic System."

This is a combination, by means of the exhaust of the ordinary pipe pressure wind, out of the "Air-chest"; so that no other separate wind pressure is used either for the manual keys, pedals, or stop action.

Two Manuals, Compass CC to C, 61 notes.

Pedal, Compass, CCC to F, 30 notes.

GREAT.

					<i>ft.</i>	<i>pipes</i>
1	Open Diapason, metal	...	...	...	8	61
2	Gamba, metal	...	...	...	8	61
3	Dulciana, metal	...	...	...	8	61
4	Clarabella, wood	...	...	...	8	61
5	Octave, metal	...	...	...	4	61
6	Clarionet, reed, metal	...	...	...	8	61

SWELL.

7	Bourdon, wood	...	...	...	16	49
8	Violin Diapason, metal	...	...	...	8	61
9	Salicional, metal	...	...	...	8	61
10	Stopped Diapason, wood	...	...	...	8	61
11	Geigen Principal, metal	...	...	...	4	61
12	Harmonic Flute, metal	...	...	...	4	61
13	Oboe, reed, metal	...	...	...	8	61

PEDAL.

14	Bourdon, wood	...	...	...	16	30
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Total ... 811

COUPLERS.

15	Pedal Octaves.	21	Swell Sub.
16	Swell to Pedal.	22	Swell Super.
17	Great to Pedal.	23	Great Sub.
18	Swell to Great.	24	Great Super.
19	Swell to Great Sub.	25	Swell Unison.
20	Swell to Great Super.	26	Great Unison.

ACCESSORIES.

27 & 28 Piano and Forte Combination Pedals to Great.

29 & 30 " " " " " Swell.

31 Great to Pedal reversible.

32 Crescendo and Diminuendo Pedal (balanced).

33 Swell Pedal (balanced).

34 Tremolo.

35 Draws all Couplers.

36 Relieves all Subs and Supers.

[From "*Musical Standard*."]

MESSRS. BRINDLEY AND FOSTER'S PATENT
"METECHOTIC" SYSTEM OF ORGAN
BUILDING.

The new instrument erected in Stafford House, London, for His Grace the Duke of Sutherland, presents features of special interest, apart from the fact that it has a well thought out specification, displaying admirable workmanship. The organ was built by Messrs. Brindley & Foster, of Sheffield and London. It contains a great organ of 4 stops, swell of 7 registers, choir of 4, and pedal of 3 stops. It is blown by an hydraulic engine placed some three storeys below the instrument itself. The organ is a remarkably successful instance of the application of tubular pneumatic action on a wind pressure of some three and a quarter inches, by which all the movements and actions are manipulated by wind. The instrument also contains some new and remarkable developments of the organ-building art, in the application of the builders' "Metechotic" system, by which a number of registers or stops are ingeniously arranged to be transferable to different manuals. This useful invention largely extends the number of effects and combinations, with a great saving of space in proportion to results obtained. Another special feature of construction is the introduction of interchangeable pistons, 2 to the great, and 3 to the swell organ. These combination pistons permit any previously arranged combination to be registered or reserved for future use at the will of the performer. This invention will no doubt greatly widen the resources of organ playing, and is more convenient than any previous stop-changing mechanism. The tone of the organ is rich and varied. The diapason work is round and even, the string-toned stops are deliciously voiced, and the *ensemble* is admirably balanced, and strikingly effective. As a fine specimen of artistically blended tones, finished mechanism, and tasteful appearance, the organ will enhance the builders' reputation. The increased use of the concert room and drawing room types of organs has of late quickened invention, and stimulated artistic voicing and construction; and our English organ builders are clearly not only equal to their responsibilities, but are worthily maintaining our national credit as lovers of the "King of Instruments."

[From "*The Organist and Choirmaster.*"]

A PLEA FOR TUNING.

By T.E.

A celebrated singer, in speaking of a celebrated organ by a celebrated builder, is reported to have said, that "it was the first or only organ he had ever heard in tune." Now this was, indeed, hard upon tuners, but that it contained some elements of truth cannot be gainsaid.

Given a good organ, few things are more annoying to a keen ear than to find that the tuning is "just passable." If the organ is not of the best, it is even more of a necessity—if any latitude in this respect can be allowed—that the tuning should be thoroughly well done. Ordinarily the mode of procedure is this—the builder *contracts* for a small sum per annum to keep the instrument in order, inclusive of tuning; the tuner periodically visits the organ, and, after having rectified sundry mechanical defects, spends the remainder of the short time allotted to his task in "going through the bearings," and tuning the rest of the organ by octaves and unisons. Without a doubt he earns his money, and achieves a dangerous and deceitful approximation to so-called "equal temperament," which usually satisfies. But it is impossible to thoroughly tune an organ of medium size in an odd hour or two, at the tail end of a day's work. Although tuning is of a highly scientific nature—much more so than it has credit for—it does not necessarily follow that the average tuner is incapable or careless; the blame, I am rather afraid, must be laid at the door of those who, for some reason or other, do not pay a sufficient sum to give the tuner a fair chance. In attributing this blame, perhaps wrongly, two powerful qualifying features present themselves—first, the sharp competition in trade, so destructive to art; secondly, the customary acceptance, by the organist, of tuning which is "near enough."

It may with some appearance of truth be argued, if the bearings are well gone through, the octaves tuned upwards and downwards, and the remainder of the organ in unison fashion satisfactory to the ear, that this is exceedingly near perfection; this I am willing to admit, but that it is strictly correct, or as good as can be obtained, cannot possibly be admitted.

Octaves and unisons, when nearing perfection, absorb slight error and deceive the ear, and it is only necessary to test them by other intervals, to reveal the imperfections of octave and unison tuning. There is only one *correct* position in pitch for each note, and that is in its proper relation to numerous test intervals. Tuners, I know, are very keen and perhaps a little tender upon this point, they pride themselves—it is a pleasant weakness, although a dangerous one—upon their ability to tune without applying these tests, but I well remember an excellent tuner (I was holding the notes,) tuning the two manuals of an organ separately, after obtaining the pitch C. He absolutely refused my desire to test the two manuals together in unison, saying somewhat caustically, “they must come right,” and as far as theory was concerned he was perfectly correct; but alas, for the fallacy of human ears, although each manual was “passable” by itself, the two together were—what shall I say? I will let him down easily—incorrect.

An obscure writer in dealing with this subject says:—“Every note throughout the organ should sound pleasantly with its fifths, fourths, thirds, sixths, minor sevenths, and tenths; and the octaves should be pure—it should not be possible to find a bad test interval upon any stop, or at any pitch; and, although this is a severe test, it is the standard which should be aimed at.”

Now what I should like to impress, and deeply impress, upon organists is this:—That good tuning pays, and pays well; first and foremost, in the satisfaction of having the instrument well in tune; secondly, in the length of time the flue-work lasts without re-tuning. It is cheapest in the end to employ a thorough artist, pay him well—he deserves it—give him plenty of time, so as to avoid having to “catch the next train,” and insist upon having the tuning thoroughly well done. The result will be the happy satisfaction of all concerned, organist, choristers, tuner, and employers, besides helping to raise the science of tuning to its proper and legitimate position or level.

It would be an easy task to cover more paper by dealing with the side issues involved in this subject, but I hope sufficient has been said to call the attention of organists to this most important matter.

VOCABULARY OF STOPS.

(SUBJECT TO GREAT VARIATION.)

- ACOUSTIC BASS**, 32ft. pitch. Undertone produced by deep fifths sounding together. See Resultant tone.
- ÆOLINE**, 8ft. pitch. Of soft and reedy tone.
- BARYTON**, 16ft. pitch. A manual Reed stop.
- BASS FLUTE**, 8ft. pitch, pedal stop. A Diapason (generally of wood).
- BASSOON**. The Reed bass of the Clarionet. A pedal Reed stop.
- BELL GAMBA**, 8ft. pitch. A Gamba having a bell or inverted cone at the top.
- BLOCK FLUTE**, 2ft. pitch. A Fifteenth of large scale.
- BOMBARDE**. Similar to Bombardon but more powerful.
- BOMBARDON**, 16ft. and 8ft. pitch. A Reed stop of medium power.
- BOURDON**, 16ft. pitch. Virtually a stopped diapason.
- CARILLONS**. Metal bars or bells.
- CELESTINA**, 4ft. pitch. Of soft tone.
- CLARABELLA**, 8ft. pitch. An open wood flue stop, usually from middle C upwards (stopped bass).
- CLARION**, 4ft. pitch. A Reed stop to strengthen the 4ft. tone, the upper portion being of open flue pipes.
- CLARIONET**, 8ft. pitch. A manual Reed stop, from tenor C upwards, resembling the Clarionet in tone, (half length tubes).
- CLARIONET FLUTE**, 8ft. pitch. A species of stopped pipe having a hole through the stopper.
- CLEAR FLUTE**, 4ft. pitch. Somewhat similar to the Wald Flute.
- CONTRA**. A prefix meaning an octave below.
- COR ANGLAIS**, 8ft. pitch. A Reed of peculiar shape; or a free Reed.
- CORNET**. A compound stop.
- CORNO-DI-BASSETTO**, 8ft. pitch. Virtually a Clarionet and its suitable bass.

- CORNO FLUTE.** Of very soft tone. Invented by Mr. Herbert Norman.
- CORNOPEAN,** 8ft. pitch. A Reed stop of firm tone.
- COUPLERS** explain themselves, as Swell super-octave to Great—*i.e.*, upon drawing the stop the octave above of the Swell organ is coupled to the Great organ.
- CREMONA,** 8ft. pitch. Virtually a Clarionet stop.
- CYMBALE.** A mixture.
- DOLCAN, DOLCE,** 8ft. pitch. A manual stop of tapering or bell-like form.
- DOPPEL FLOTE,** 8ft. pitch. An open pipe having two mouths: two ranks of pipes.
- DOUBLE.** A prefix; of double length, an octave lower.
- DOUBLE DIAPASON,** of 16ft. tone. Bourdon.
- DOUBLETTE.** Two ranks, one of Fifteenth and one of Twenty-second pipes. A Fifteenth.
- DULCET,** 4ft. pitch. A Dulciana Principal.
- DULCIANA,** 16ft., 8ft. and 4ft. pitch. An open diapason of very small scale, and soft and delicate tone.
- DULCIANA MIXTURE.** A mixture of Dulciana scale.
- ECHO.** A prefix signifying distant effect, as Echo Gamba, a Gamba of small scale and light tone.
- FAGOTTO,** 16ft. pitch. A Reed stop of very moderate power.
- FIFTEENTH,** 2ft. pitch. Fifteen diatonic notes above pitch. An open metal pipe having the same relation to the Principal as the Principal has to the Open Diapason. Of 4ft. pitch in the Pedal Organ.
- FLAGEOLET,** 2ft. pitch. A soft flue manual stop.
- FLAUTINA DOLCE,** 2ft. Similar to Flauto Dolce an octave higher.
- FLAUTINA,** 2ft. pitch. A species of Fifteenth.
- FLAUTO DOLCE,** 4ft. pitch. An octave Dolce.
- FLAUTO-PICCOLO,** 2ft. pitch. Similar to Piccolo.
- FLAUTO TRAVERSO,** 4ft. pitch. Resembling in tone the German or orchestral flute.
- FLUTE,** 8ft. and 4ft. pitch. An open or stopped pipe of flute-like tone.

FLUTE A CHEMINEES, 8ft. pitch. A flute having a hole or tube in the stopper.

FLUTE A PAVILLON, 4ft. pitch. Bell-shaped pipes.

FLUTE BASS. An 8ft. pedal stop.

FLUTE D'AMOUR, 8ft. or 4ft. pitch. Soft in tone.

FLUTE HARMONIQUE, 8ft. and 4ft. pitch. A flute or open pipe of double speaking length.

FLUTE TRAVERSIERE. See Flauto Traverso.

FULL MIXTURE. A powerful mixture.

FURNITURE. A mixture.

GAMBA, 16ft., 8ft. and 4ft. pitch. An open slotted stop of small scale and of stringy or reedy tone.

GEIGEN PRINCIPAL, 8ft. pitch. A small open diapason.

GEMSHORN, 4ft. pitch, and occasionally of 8ft. pitch. An open pipe softer than the Principal, sometimes conical.

GERMAN GAMBA, 8ft. pitch. Somewhat similar to the Viola-di-Gamba, but of larger scale and more powerful in tone.

HARMONIC. Of the nature of harmonics. A prefix signifying that the pitch is derived from pipes of double, or twice double, speaking length.

HARMONIC FLUTE. See Flute Harmonique.

HARMONIC PICCOLO, 2ft. pitch. The corresponding stop to the Harmonic Flute.

HAUTBOY, or **OBOE**, 8ft. pitch. A soft manual Reed stop resembling the Hautboy in tone.

HOHL FLUTE, 8ft. pitch. An open wood flue manual stop somewhat similar to the Clarabella, having the mouth at the wide side, cut up high ; sometimes triangular in section.

HORN, 8ft. pitch. A powerful manual Reed stop.

HORN DIAPASON, 8ft. pitch. An Open Diapason of reedy tone.

KERAULOPHON, 8ft. pitch. A species of Gamba of small scale and delicate tone.

LARIGOT. A mutation stop or rank sounding the 19th.

LIEBLICH. A prefix meaning sweet.

LIEBLICH GEDACT, Gedackt, Gedeckt, 8ft. pitch. A soft-toned stopped (or partly stopped) diapason.

MIXTURE. A mutation stop consisting of two or more ranks of pipes, as 15th, 19th, 22nd, above pitch.

MONTRE, 16ft. and 8ft. pitch. Open Diapason.

MOUNTED CORNET. See "Memoranda."

MUSETTE. A free reed.

NASON, 4ft. pitch. Stopped wood pipes.

OBOE. See Hautboy.

OBOE-FLUTE, 4ft. pitch. Of wood; reedy and delicate tone.

OCTAVE, 4ft. pitch. A Principal. Of 8ft. pitch on Pedale.

OCTAVE QUINT, 2 $\frac{3}{4}$ ft. pitch. A Twelfth.

OPEN. A prefix signifying open at the top.

OPEN DIAPASON, 32ft., 16ft., 8ft. and 4ft. pitch. A flue stop open at the top.

OPHICLEIDEF, 16ft. pitch. A powerful pedal Reed stop.

ORCHESTRAL FLUTE. Resembling the instrument used in the orchestra.

ORCHESTRAL OBOE, 8ft. pitch. An oboe stop of peculiar make, having a hole near the top of the pipe.

PICCOLO, 2ft. pitch. A wood or metal stop of soft tone.

POSAUNE, 16ft., 8ft. pitch. A powerful Reed stop.

PRESTANT, 4ft. pitch. Principal.

PRINCIPAL, 4ft. pitch. A metal open stop of softer tone than the Open Diapason. Of 8ft. pitch in the pedal organ.

QUINT, the fifth. Pipes sounding the fifth (or its duplicate) above pitch.

QUINTADENA. Somewhat similar to Quintaton but the twelfth more strongly pronounced.

QUINTATON. A stop speaking a trace of the twelfth.

ROHR, OR REED FLUTE, 8ft. pitch. A metal stopped diapason having a hole in the stopper.

SALICIONAL or SALICET, 8ft. pitch. An open pipe of small scale.

SESQUIALTERA. Two or more ranks of pipes sounding the harmonics of the prime note of the ground-work of the organ, as 17th, 19th, 22nd.

SHARP MIXTURE. A mixture consisting of the higher harmonics, as 26th, 29th.

- SPITZ FLUTE**, 8ft. pitch. An open pipe of light Gemshorn tone.
- STENTORPHON**, 8ft. pitch. A very powerful reed stop.
- STOPPED**. A prefix; having a plug, or closed at the top.
- STOPPED DIAPASON**, 32ft., 16ft., 8ft., 4ft. and 2ft. pitch. A pipe having a plug, or closed at the top.
- SUABE FLUTE**. Similar to Clarabella with inverted lip, and of smaller scale.
- SUB**. A prefix. See *Contra*.
- SUB-BASS**. Another name for *Bourdon*.
- SUB-BOURDON**, 32ft. pitch. An octave *Bourdon*.
- SUPER**. A prefix, meaning above.
- SUPER-OCTAVE**, 2ft. pitch. A Fifteenth or *Piccolo*.
- TENTH**, $6\frac{2}{3}$ and $3\frac{1}{2}$ pitch. Ten diatonic notes above pitch: sounding the third or its duplication: similar to the *Tierce* an octave lower.
- TERPODION**, 8ft. pitch. A stop to imitate the tone produced from bars or sticks of wood. A species of *Gamba*.
- TIERCE**. A third. A mutation stop or rank speaking a duplication of the third. A seventeenth.
- TIRASSE**. A coupler.
- TREMULANT**. A drawstop or pedal which brings on the action of the tremulant.
- TROMBA**, 8ft. pitch. A trumpet.
- TROMBONE**, 16ft. pitch. A pedal Reed stop.
- TRUMPET**, 8ft. pitch. A powerful Reed stop.
- TUBA MIRABILIS**, 8ft. pitch. A Reed stop of very great power.
- TWELFTH**. Sounding the interval of the twelfth above the ground tone.
- UNDA MARIS**. Of waving tone, similar in principle to the *Voix Celeste*.
- VIENNA FLUTE**. A species of *Suabe* flute.
- VIOLA**, 8ft. pitch. A Violin diapason. In tone something like the *Gamba*.
- VIOLA DI GAMBA**, 8ft. pitch. A very stringy *Gamba*.
- VIOL D'AMOUR**, 8ft. pitch. A sweet-toned Violin diapason.
- VIOL D'ORCHESTRE**, 8ft. pitch. Of very small scale.

VIOLIN DIAPASON, 8ft. pitch. An open diapason of small scale and stringy tone.

VIOLONCELLO, 8ft. pitch. A pedal stop resembling the Violone an octave higher.

VIOLONE, 16ft. pitch. A soft pedal open Diapason (or Gamba) of small scale.

VOIX CELESTE, 8ft. pitch. A stop of two delicate-toned ranks of pipes, one rank being tuned a little sharp, causing a waving effect.

VOX ANGELICA, 8ft. pitch. Similar to the Voix Celeste, but the waving note tuned flat: also a very delicate stop of small scale.

VOX HUMANA, 8ft. pitch. A Reed stop of peculiar construction intended to represent the human voice.

WALD FLUTE, 8ft. and 4ft. pitch. A species of Clarabella having the mouth inverted.

ZAUBERFLOTE. Similar to Quintadena. Invented by late Mr. Thynne. See "Memoranda."

MR. R. HOPE-JONES' SPECIAL STOPS.

DIAPASON PHONON. Metal, of 16 and 8 feet pitch.—This Stop is of greater power than the largest Open Diapason, but is somewhat similar in tone. The first and third harmonic partials are, however, less prominent.

DIAPHONE. A kind of tremulant pipe of iron or wood, of 8, 16, and 32 feet pitch.—This Stop is of extraordinary power and quite overshadows all reed and flue pipes. The strength of tone may, however, be modified by reducing the wind pressure, (as in the case of the Harmonium) without altering the pitch. The quality of tone may be made to resemble a powerful Diapason, a Diapason-tuba or a Diapason-trombone. In all cases, however, the foundation tone is very prominent. This Stop is made to serve as the foundation of all large instruments. Its smooth and majestic power is practically unlimited. It keeps in tune with the flue work under all variations of temperature.

HEDEIAPHON. Of 8 feet pitch.—The tone of this Stop is produced from resonant gongs by means of an alternating current of air. It is of peculiar beauty.

KALLIOPE. Metal, of 8 and 4 feet pitch.—A soft Stop of curious and pleasing tone, more useful in solo passages than in chords.

KINURA. Brass, of 8 feet pitch.—A plaintive and exceedingly soft echo Reed Stop.

LIEBLICH GESCHALLT. Metal, of 8 feet pitch. A very soft Stop somewhat resembling a Lieblich Gedact.

PHONEUMA. Metal, of 8 feet pitch.—An exceedingly delicate Stop of the nature of a Voix Celeste, but of different tone quality.

RESONANT CUBES. Of 32 and 16 feet pitch.—These may under certain circumstances be used instead of large pipes where space is limited.

TIBIA CLAUSA. Wood, of 8 feet pitch.—This is a peculiarly beautiful Stop somewhat resembling the Stopt Diapason, but much more liquid, and heavy in tone. Though its chief use is to serve as a background for other stops, it is very well adapted for solo work.

TIBIA DURA. Wood, of 8 and 4 feet pitch.—This Stop is of a peculiarly telling and penetrating quality. It is altogether inadmissible in many buildings, while in some it is the only Stop with which we are acquainted that can bind the various tones of the organ into one harmonious whole. It is useful as a solo stop.

TIBIA MOLLIS. Wood, of 4 feet pitch. A delicate Stop of a peculiar quality of fluty tone.

TIBIA PLENA. Wood, of 8 feet pitch.—This Stop furnishes almost pure foundation tone free from harmonic upper partials. Though beautiful for solo purposes its chief use is in combination with the 8 feet Diapason and other foundation work of the organ. In many buildings its effect is extraordinary and conveys the impression that a sixteen-feet stop is in use. Alone it sounds like a cloying, dull and heavy flute.

TIBIA PROFUNDA AND TIBIA PROFUNDISSIMA. Wood, of 16 and 32 feet pitch.—The natural bass of the Tibia Plena. Not unlike the ordinary wood pedal Open Diapason, but heavier and duller in tone and more prompt in speech.

TUBA PROFUNDA AND TUBA PROFUNDISSIMA. Metal, of 16 and 32 feet pitch.—The natural bass of the Tuba Sonora. Very round and smooth in tone.

TUBA SONORA. Metal, of 8 feet pitch.—A heavy Reed Stop of new pattern. Much fuller and smoother in tone than the Tuba Mirabilis and more fitted for general use. This Stop is generally enclosed in a swell box, and when great power is required is furnished with two tongues to each pipe made to synchronise by pneumatic agency.

VOCABULARY

OF

TECHNICAL TERMS.

Accessories. Mechanical aids, as Composition pedals, thumb pistons, ventils, Swell pedals, &c.

Action. The mechanical portion of the instrument.

Acute. Of high pitch.

Amplitude. Extent.

Anemometer. A windgauge or instrument for ascertaining the pressure of wind.

Arched mouth of a pipe. Having the upper lip curved.

Backfall. A wooden lever working upon a centre.

Backfall action. See "Actions."

Backfall beam. The beam in which the backfalls are set.

Backfall centre. The point of suspension in the beam.

Backfall coupler. A coupler in which backfalls actuate the connections.

Balanced swell pedal. Applied to those swells which do not close by means of gravity, weight, or spring.

Balance of tone. In due proportion as to pitch and quality of tone.

Bars. The strips of wood above the pallets forming the channels.

Base. The lowermost part of a column.

Bass side. The side adjacent to the bass of the manuals.

Bat or oval pins. Key pins, the section of which resembles that of a cricket bat.

Battlement. An alternate stepwork of a moulding.

Bay. A complete section or division of the case.

Bay leaf. A pointed upper lip of metal pipes.

Baywood. A superior species of mahogany used for sound boards.

Bead. A simple convex moulding having a quirk.

Beard. A projection below the mouth of the pipe to check the in-rush of wind.

Bearers. The wood between the slides.

Bearings. The notes and intervals from which the tuning or temperament is derived. The beds for pivots.

Beat. A wave, throb or pulsation.

Beating reed. One which hits the face of the reed, as distinguished from a free reed.

Bed. A resting place. To rest firmly and solidly.

Bell of a pipe. The inverted cone at the top of a pipe.

Bellows. The wind reservoirs and wind producing portions of the organ.

Bellows stays. A movement (generally of iron) to preserve a parallel motion of the parts of the reservoir.

Bevelled. Having the edge sloped or chamfered to an angle other than a right angle.

Bleeding. An illegitimate means of silencing pipes sounded by "running" wind, by puncturing the feet, or the under side of the wind channel: a process totally unnecessary with good workmanship.

Block. In a wooden pipe the part corresponding to the languid of a metal pipe. In a Reed stop the piece of metal fitting into the boot.

Body of a pipe. See Speaking length.

Bonnet. A curved covering to metal pipes (reeds) to exclude dust.

Boot. The lower part of a Reed pipe into which the block fits.

Borrowing. Making use of pipes belonging to one stop to act as part of another stop.

Brace. A stay, or fixed diagonal support.

Break. An alteration in the size, length, or nature of the pipes, from open to stopped pipes; from harmonic pipes to pipes of

natural length; in mutation stops, from the set combination to the octave below; an alteration in the number or combination of the pipes; in reed work, from reed pipes to flue pipes.

Bridge. The link connecting two rollers to work as one. The bar across the mouth of a pipe.

Building-frame. The skeleton framework of the organ.

Bushed. Lined with cloth.

Bushing. The felting or clothing of a hole or mortise.

Button. A leathern nut for regulation of the action, also a fastening.

CCC. The 16ft. C. CC—The 8ft. C. C—The 4ft. C, &c.

C¹. Middle C (8ft. pitch). Open pipe 2ft. in length.

C². The octave above middle C. Open pipe 1ft. in length.

C³. The second octave above middle C. Open pipe 6in. in length.

C Organ. An organ, the lowest manual key of which is CC.

C sharp side. That side of the instrument upon which the C sharp pipes stand.

C side. That side of the instrument upon which the C pipes stand.

C under C. The middle C of the pedal board being directly in line with the middle C of the manuals.

Cap. OF A WOODEN PIPE—The covering screwed on over the block and lower part of the pipe, and hollowed or shaped to form the wind passage and wind way. OF A REED PIPE—A covering with which to regulate the power, and consonance of the tube.

Capacity of bellows. Bellows should have a capacity of from two to three superficial feet per average speaking stop, and a rise of about twelve inches.

Capital. The uppermost part of a column.

Centre pin. Of the key or drawstop movement.

Centre pins. The pins on which movements are hung or move.

Chamber organ. Applied to an instrument for use in a dwelling.

Chamfer. See Bevelled.

Channel. The wind passage formed by the bars above the pallet.

Check valve. A valve to prevent wind from one groove or source entering another.

Cheeks. Side pieces or blocks.

Chiffing. A term used in voicing to denote barking in speech.

Choir. Ch. Applied to the Choir organ or any of its appurtenances.

Choir organ. The organ of soft tone used for accompanying the voices.

Chorus work. The stops of mutation character.

Chromatic succession. In semitonal order.

Ciphering. The sounding of a pipe or pipes when it or they ought not to do so.

Clamp. To secure from shifting. Applied to woodwork when the ends are flush cross joined to prevent warping.

Clavier. A set of keys, a manual.

Clearing room. Sufficient movement of action to prevent undesirable contact.

Clear sized. Sized without colouring.

Cleat. A wooden hook or block to secure or give support.

Closed. When the drawstop is in; the slide preventing the pipes of the stop from sounding; the top of a pipe being stopped.

Closed reeds. Those in which the face of the reed is partially closed.

Cloth. A small collar used with the buttons.

Collar. A cloth used with leather buttons; a washer.

Colour of key. The complexion produced by the unevenness of the rate of pulsation of intervals in unequal temperament. The complexion given to a key by its pitch, or number of vibrations, and the rapidity of the pulsations in tuning.

Combination. A selection of stops.

Combination pedals or pistons. Form set combinations of stops when used.

Compass. The distance or difference in pitch between two extreme notes.

Compensating reed. See "Reed Stops."

Composition pedal. Forms a set combination of stops when used.

Compound stops. Those of the mixture tribe.

- Concave pedal board.** One which is concave in form.
- Concert organ.** An instrument for hall or concert use.
- Concussion bellows.** A feeder automatically governing the pressure of wind.
- Condensation.** Becoming more dense.
- Cone.** A tool used for tuning open metal flue pipes.
- Console.** The manuals, drawstops, pedals, accessories, and their fixings; generally applied to those organs where these are detached from the main portion of the instrument.
- Consonance.** Concord.
- Continental, Normal or French pitch.** See "Fine tuning."
- Conveyance.** A metal tube which conveys the wind to a pipe standing away from its proper channel, or upon a different level.
- Conveyanced off.** Applied to a pipe which requires a conveyance.
- Corbel.** A projecting support.
- Countersunk.** Applied to a hole enlarged at the top to enable the head of a screw to set flush with the woodwork.
- Coupled up.** Having all couplers drawn.
- Coupler.** The mechanism uniting actions or manuals to each other, or to the pedals.
- Coupler keys.** Instead of drawstops.
- Covered pipes.** Having stoppers or caps.
- Coving.** The segmental circular overhanging portion of the organ.
- Cow-heel.** See "Swell pedal."
- Crescendo pedal.** See "Memoranda."
- Crescendo and decrescendo pedal.** A pedal which throws out and takes in the stops in their proper order of succession as to power and pitch.
- Cut pallet.** See "Divided pallet."
- Cutting.** A term used to denote piercing tone.
- Cylinder.** A tuning slide or metal clip to tune open metal pipes by.
- Depth of touch.** The amount of depression of the key.
- Desk.** The board or frame for the music of the performer.

Desk hook. The hooks for holding the music open.

Diagonal drawstops and jambs. Those which stand at an angle.

Diagonal feeder. A feeder, the board of which moves to an angular position.

Diapasons. The necessary flue stops of foundation pitch.

Diminuendo pedal. See "Memoranda."

Direction pins, Pallet pins, Steady pins. The pins (in the bars of the wind-chest) which guide the pallet.

Dissonance. Discord.

Divided or cut pallet. A pallet which is divided in its length, acting similarly to a split pallet.

Divided organ. An organ built in portions apart.

Double C. CC.

Double pallet. Two pallets to one key. See "Sound-boards and Wind-chests."

Double tongued. Reed stops having two tongues instead of one.

Double touch. Keys sometimes have a double or second touch, so that by depressing a key beyond the first touch, to its full depth, another stop or other stops are brought into operation for solo or powerful effects. Its drawbacks are, the difficulty of manipulation, and the pipes of the second touch speaking after those of the first.

Dovetailed. Joined by fan-shaped projections.

Dowel. A pin fitting into a hole to ensure correct position in fixing woodwork.

Drawn. When the drawstop is out, or the slide in a correct position to allow the pipes of the stop to sound fully.

Drawstop. The Stop knob and its shaft.

Drawstop jambs. The woodwork through which the drawstops move.

Drum coupler. See "Couplers."

Duplicate or double pallets. Having more than one pallet to a note.

Duplication. Obtaining two stops, differing in pitch an octave, from a single set of pipes. (See Casson's system.)

Ears of a pipe. The blocks, or pieces of metal standing out from the pipe at the sides of the mouth, to prevent spreading of the wind.

Easing the shades. Of reed stops for minute alterations of pitch in tuning.

Echo. Applied to the Echo organ or any of its appurtenances.

Echo organ. The organ of soft tone and distant effect.

Eight feet C. The pitch of an open pipe of about that length.

Eight-foot pitch. Singing, or ordinary pitch; the pitch of the Manual Diapasons: so called because the length of the lowest C pipe of the Open Diapason (and kindred stops) upon the manuals approaches 8 feet.

Elbowed pipes. Knuckled at the top.

Electro pneumatic Action. See "Actions."

Enharmonic change. Practically a change in the musical notation, denoting (upon a fixed keyboard) the same sounds, as D flat, C sharp; strictly speaking, a change of sounds of nearly the same pitch.

Equal Temperament. The division of the octave into semitones at equal distances apart. The result of an *even* distribution of the pulsations in tuning.

Escape of wind. Loss of wind from some defect.

Even temperament. The correctly graduated distribution of pulsations in tuning.

Exhaust. The reverse of compression—a valve to allow compressed air to escape.

Facade. Front view or elevation.

Fan. A wide trundle or roller used in composition pedal action.

Fancy stops. Those which appeal to the imagination and are supplementary to foundation or necessary stops.

Fan-frame movement. A backfall action spreading like a fan.

Fan Trumpet. See "Memoranda."

Feeder. The lower portions of the bellows which feed the reservoir with wind; or a similar contrivance.

Felted. Fitted with felt or cloth.

Fiddle G. The lowest note on the Violin—the G in the fourth space of the Bass stave.

Fine tuning. Accurate adjustment of temperament.

Finials. Upper terminals of the uprights of the case.

First touch. The upper touch of double touch.

Fixing. Applied to small pieces of joinery used in fixing up.

Flange. A projection on a pipe or tube to connect by.

Flat. Below pitch. The pipes of the front which are in a straight line.

Flatten. To fall in pitch.

Floating frame. The middle frame of the reservoir of the bellows.

Flue pipes. Labial stops (strictly speaking, open pipes).

Flue work. Pipes which are open at the top—also applied as distinguishing lip or pipe work from Reeds or Reed work.

Flute work. The stops of fluty tone.

Foot. That portion of a pipe which conveys the wind.

F Organ. An organ, the lowest manual key of which is FF.

Fork. The slotted end of a portion of the action, as in drawstop movements.

Foundation tone. Fundamental or necessary stops, as distinct from fancy stops.

Four feet C. The pitch of an open pipe of about that length.

Four-feet pitch. An octave above 8ft. pitch (see 8ft. pitch), the pitch of a stop the lower open C pipe of which upon the manuals is about 4 feet in length, or sounding 4ft. tone.

Framing. Skeleton carcase work strongly joined.

Free Reeds. Those in which the vibrator passes through the opening without striking.

French feeder. An auxiliary reservoir for wind.

French leaf. An ornamental upper lip of metal pipes rounded instead of pointed.

Frieze. A horizontal feature of the casework.

Front board of wind-chest. The board screwed on the wind-chest in front of the pallets.

- Front pipes.** The pipes forming the front of the instrument.
- Full.** A loose term in organ works, as Full Great, the Great organ stops without (or with) the Reeds. **FULL ORGAN**—the entire power.
- Full compass.** Having the correct number of notes to complete the stop or organ.
- Gamut G.** The G on the first line of the Bass stave.
- G Organ.** An organ, the lowest manual key of which is GG.
- Grave.** Of low pitch.
- Great.** (Gt.) Applied to the Great organ or any of its appurtenances.
- Great organ.** The chief manual or organ.
- Great to pedal coupler.** One by means of which the Great organ is coupled to the pedals.
- Grooved off.** The wind being conveyed to a pipe by a groove in the wood work.
- Grounds.** The skeleton lowermost framing on which the organ is built.
- Guide pins.** See direction pins.
- Gussets.** The leather covering the corners of the bellows (where the ribs would meet if continued).
- Half diameter or dimensions.** Measurements which reach half size.
- Half lapped.** When half the substance is cut away in both portions of a joint in framework.
- Half-length pipes.** Pipes of half speaking length.
- Half-measure.** When the pipes of a stop reach half diameter. In stops of the Open Diapason family this occurs at about the 17th pipe.
- Half-stopped pipes.** Pipes not completely closed at the top.
- Harmonic pipes.** Pipes sounding harmonics to their natural speaking lengths.
- Harmonics.** Overtones.
- Heavy wind.** Of high pressure.
- Hooded pipes.** Knuckled over at the top.
- Hook rail.** The rail to which the long wood pipes are hooked.

Horse shoe pedal. A reversing pedal in shape similar to a horse shoe.

Instrument of concussion. One in which speech or tone is produced indirectly or by secondary means—the reverse of percussion.

Instrument of percussion. One in which the speech or tone is produced by a direct blow.

Interchangeable pistons. Those which admit of the combinations being altered.

Interval. The distance in pitch from one note to another.

Interval, tempered. One which is tuned to differ somewhat from just intonation in order that the notes of which it is composed may also serve as component notes of other intervals.

Inverted mouths of pipes. Have the splay of the upper lip inside the pipe.

Jamb. An upright side casing.

Jump. A break in line, continuity, or order of succession.

Just intonation. Without pulsation, wave, or beat; truly in tune.

Key. Applied to both manual and pedal movements, also to appertaining movements.

Key-board. The manual keys and frame.

Key scale. The distances from each other of the centres at the acting portions of the keys.

Key slip. A strip of wood near the front of the keys.

Key stops. (See Marylebone organ.)

Key tail. The far end of a manual key.

Key touches. (See "Electric and pneumatic actions.")

Knee board. The board or panel in front of the knees when seated at the instrument.

Labial pipes. Those in which the speech is produced by lips, etc., as distinguished from reeds.

Languid. The horizontal disc of metal in the pipe near the mouth.

Lap. Having a portion of the substance cut away in joining.

Laying the bearings. The process of distributing the pulsations in tuning—deriving the temperament.

Leaf of a pipe. The upper lip and flat.

Ledged. Joined by means of projecting cross boards or scantling.

Light wind. Of low pressure.

Lips of a pipe. The edges and formation above and below the mouth of a pipe.

Long ears. Are sometimes attached to stopped metal pipes to tune by.

Loop. An eye soldered on the backs of front pipes, or reed pipes, to stay them up by.

Louvre. A swell shutter.

Manual coupler. The mechanism uniting one manual to another.

Manual helps. (See "Casson's system.")

Manuals. The keyboards.

Matched. Grooved and tongued.

Medium, or Society of Arts pitch. See "Fine Tuning."

Melodia. See "Casson's System."

Metechotic. See "Brindley & Foster's System."

Middle board of bellows. The board immediately above the feeders.

Middle C. The key of the manuals two octaves above the lower C. The C upon the first ledger line below the treble stave; the C upon the first ledger line above the bass stave, also the middle C upon the great stave. The middle C upon the pedals.

Mitre. An angular joint as distinct from a curve or bend.

Mop. An instrument for temporarily silencing pipes of mixtures.

Mortise. A hole cut to receive the tenon, or for other requirement.

Motor. A small feeder inflated and collapsed by means of air—an engine.

Mounted Cornet. See "Memoranda."

Mouth. The horizontal opening above the foot of a pipe.

Mullions. The inner vertical parts of framing.

Mutation. Of the nature of harmonics, as the 8th, 12th, 15th, 17th, 19th, 22nd and 29th, etc., *above* the prime tone.

Naturals. The white notes.

Nicking. The serrations on the block or languid of a pipe at the windway.

Node. A point of rest or inactivity.

Octave. The compass of eight diatonic, or thirteen chromatic notes ; the distance from a note to the next one of the same name.

Octaves up and down. A term used in tuning octaves after the bearings are laid.

Open pipes. Pipes which are open at the top.

Open reeds. Those in which the face of the reed is open throughout its length.

Order of succession. The arrangement or order of progression of pipes or channels.

Organ chamber. A place specially built or set apart for the organ to stand in.

Organ loft. The small chamber or place which the performer occupies.

Overblown. Having too much wind.

Overhang. Applied to a square projection without support immediately beneath.

Overlength. Applied to front pipes—the bodies of which for purposes of design are longer than speaking length.

Overtones. Harmonics yielded by a prime tone.

Pallet. The valve in the wind-chest which admits the wind to the channel.

Pallet eyes. The loop or staple to which the pull down wire is connected.

Pallet pins. Steady pins to guide the pallet.

Pallet-springs. The springs in the wind-chest which close the pallets.

Pallet tails. The sloping portions where they are hinged.

Panel. A sheet of wood, sometimes set in a frame, and removable.

Partial tones. The overtones or harmonics yielded by musical sounds.

Passage board. A board to walk or stand upon, for tuning purposes.

Pedal (Ped.). Applied to the Pedal organ or any of its appurtenances.

Pedal-board. The set of keys played by the feet.

Pedal coupler. The mechanism uniting a manual, or octave to the pedals.

Pedal helps. (See "Casson's system.")

Pedal organ. The organ belonging exclusively to the pedals.

Pedals. The keys played by the feet; applied to denote pedal stops, as the open diapason on the pedals; also appliances used by the feet.

Pedal scale. See key scale. The scale of pedal pipes.

Pediment. A triangular part rising from the main structure.

Periodicity of a pipe. The time occupied by its vibration; its natural pitch.

Philharmonic or Concert pitch. See "Fine Tuning."

Pilaster. A kind of flat rectangular ornamental column.

Pin rail. A rail to receive pins.

Pipe block. Pipes conveyanced off stand in a block of wood bored for the pipe and conveyance.

Pipe foot. The lower part of the pipe which conveys the wind to the body or speaking part.

Pipe hook. A wooden hook applied to long pipes to keep them in position.

Pipe metal. The metal of which pipes are made, varying from about 25 per cent. of tin to nearly pure tin, but generally applied to plain metal.

Pipe rack. A raking stay for long metal pipes.

Pipes. The tube or body of the tone producing parts.

Pipes stand over their wind. When they receive it direct from the channel.

Piston. A movement to actuate drawstops.

Pitch. The number of vibrations of a sound. The degree of gravity or acuteness of a sound.

- Plain metal.** A mixture of tin and lead. Pipe metal without spots as distinct from spotted metal. Spots appear when the proportions of tin and lead equal one third of tin to two thirds of lead.
- Plinth.** A lowermost horizontal member, or skirting.
- Ploughed.** Grooved (for jointing).
- Plugging.** The stopping in the foot of a wooden pipe.
- Pneumatic.** By means of air.
- Pneumatic lever Action.** See "Actions."
- Poppet pedal.** A reversing pedal.
- Power.** Degree of strength.
- Pressure of wind.** The measurement, or amount of compression of the wind.
- Puff.** A leathern disc used in pneumatic work.
- Pull-down wire.** The wire passing into the wind-chest and attached to the pallet.
- Pulsation.** A wave, throb, or beat.
- Quality of tone.** *Timbre* (French), complexion of sound.
- Quirk.** A deep narrow sinking in a moulding.
- Rack board.** The board supported by pillars from the upper board, to keep the pipes in an upright position.
- Rack pillars.** The uprights supporting the rack board.
- Radiating.** Spreading like a fan.
- Radiating pedal board.** One in which the pedals radiate or spread like a fan.
- Rails.** The horizontal parts of framing.
- Rake.** Diagonal.
- Rank.** A row or set of pipes.
- Rarefaction.** Becoming thinner.
- Ratchet.** Having teeth to engage with a catch or pall.
- R.C.O.** Royal College of Organists.
- Recommendations of the R.C.O.** See "Conference on organ construction."
- Reeds.** Reed stops, the pipes of which derive their speech from vibrating tongues; the metal tubes upon which the vibrators strike.
- Reed work.** The Reed stops.

- Register.** A stop; a perforated guide for trackers, etc.
- Registering.** The art and act of forming combinations of stops.
- Regulating up.** The process of regulating the action to the correct depth of touch.
- Relief pallet.** A split or divided pallet. The waste valve of the bellows.
- Reservoir.** The upper portion of the bellows (which stores the wind).
- Resolutions of the R.C.O.** See "Conference on organ construction."
- Resonant.** Sympathetic; responding to tone.
- Resultant tone.** An acoustic effect produced by deep sounds a fifth apart. See "Pedal stops."
- Reversing pedal.** A pedal which reverses a movement.
- Ribs of the bellows.** The boards which fold together.
- Robbing.** One pipe sucking the wind of another.
- Roller.** A metal or wooden rod turning on pins at the ends, and having two projecting arms; used for conveying the movement sideways.
- Roller arms.** The arms projecting from the roller.
- Roller board.** The board on which the rollers are fitted.
- Roller studs.** The blocks in which the pins of the roller work.
- Rollered off.** The movement being led sideways by means of a roller.
- Running.** The wind passing along the slide, or from one channel to another.
- Sag.** To bend or droop.
- Sap.** The outer edge of wood next the bark, liable to decay and unsuitable for good work.
- Scale.** The internal area or diameter of a pipe. The relative proportion of one pipe to another. Open Diapason pipes usually reach half diameters at about the 17th pipe. Mr. Lewis in his "Organ Building" gives the scale of an Open Diapason as follows:—CC, 6in.; C, 3½in.; Mid. C, 2½in.; 1ft. C, 1½in.; 6in. C, ¾in. The scales of stops in an organ are proportioned to the scale of the Open Diapason.

Scantling. Small rectangular timber.

Second touch. The lower touch of double touch.

Septave. The compass of seven diatonic notes (upwards from the tonic,) a semitone less than an octave.

Setting out. Marking the correct positions for the workman, or sizes of parts.

Shade. A flap of metal at the top of a reed pipe to regulate the power, and consonance of the tube; at the top of a flue pipe to tune by; also applied when the tone, pitch, or power of a pipe is affected through being shaded or shadowed by an obstruction.

Shake. A split in wood.

Sharp. Above pitch. A black note.

Sharpen. To rise in pitch.

Shift. The amount of movement of the slide.

Ship-lapped. Lapped diagonally.

Shore up. To temporarily support. A strut.

Short grain. Cross grain in wood, liable to give way.

Shoulder. A set back formed by cutting away in woodwork.

Show pipes. Front or case pipes.

Sixteen feet C. The pitch of an open pipe of about that length.

Sixteen feet pitch. The pitch of a stop, the longest pipe of which is about 16ft. in length; or sounds 16ft. tone. An octave below 8ft. pitch (see 8ft. pitch).

Slide, or slider. The perforated slip of wood (actuated by the drawstop) which covers and uncovers the holes in the table and upper board of the wind-chest.

Sling. A hanging lifting movement.

Slot. A portion cut away something like a mortise.

Slotted pipes. Pipes having a slot or opening near the top.

Socket. See Boot.

Solo organ. The organ consisting of solo and orchestral-toned stops.

Sound-board. The upper portions of the wind-chest.

Speaking length of a pipe. The length of that portion of the body of the pipe which governs its pitch.

Speaking room. Ample space for the pipe or pipes to sound in.

Specification. A complete list of the stops and accessories of an organ.

Specification, Working. A detailed statement of works necessary to be done in building an organ.

Splay. At an angle otherwise than a right angle.

Splayed backfalls. Backfalls which radiate or spread like a fan.

Split-pallets. Pallets which are divided in the direction of their length.

Spotted metal. Metal in which the proportion of tin to lead is sufficient to cause spots to appear on the surface. Mr Lewis specifies the proportions to be at least 100lb. of refined tin to 112lb. of pure lead; and of great substance. Small spots appear when about one third of tin is used. The thinner the metal the larger the spots, more tin being required to produce the same effect in thicker metal.

Square. A metal or wooden crank working on a pin.

Square and tracker Action. See "From key to pallet."

Square-rising feeders. Those in which the boards rise level as distinct from diagonal feeders.

Stay. A support.

Steady pins. Pins guiding the pallet.

Steady wind. Not fluctuating in pressure.

Sticker. A light wooden rod which pushes.

Sticker wire. The wire at the end of a sticker.

Stiles. The outer vertical parts of framing.

Stop. Strictly speaking applied to a set of pipes, but loosely used; a drawstop.

Stop chamfered. Chamfered, but having an ornamental termination to the chamfer instead of it being continued throughout.

Stop keys. Keys actuating the stops instead of drawstops.

Stopped pipes. Pipes having plugs or stoppers, or closed at the top.

Stop switch. (See St. John's, Birkenhead, organ.)

Striking Reed. One in which the vibrator hits the face of the reed.

Stud. The block in which a roller pin works. An upright rectangular support.

Sub-octave coupler. The mechanism uniting the octave below.

Suction of the pallet. The adherence of the pallet, due to the pressure of wind.

Super-octave coupler. The mechanism uniting the octave above.

Swell. (Sw.) Applied to the Swell organ or any of its appurtenances.

Swell organ. The organ enclosed within the swell box.

Swell pedal. The pedal for the foot which operates the swell shutters.

Swell shutters. The boards or louvres (operated by the swell pedal) in the front or ends of the swell box.

Sympathetic. In agreement with.

Table. The upper surface of the board above the channels of the sound-board.

Tapped wire. A wire having a thread or screw cut upon it for the leathern button.

T.C. Tenor C.

Tell-tale. The weight suspended from the bellows to denote the wind.

Temperament. The distribution of pulsations in tuning.

Tempered intervals are those in which the notes designedly deviate from true or just intonation in order that they may be available as notes of other intervals, or as components of chords.

Tenon. The end (of a rail) cut thinner to go into the mortise.

Tenor C. The C in the second space of the bass stave.

Thirty-two feet C. The pitch of an open pipe of about that length.

- Thirty-two feet pitch.** The pitch of a stop the lowest C pipe of which is about 32ft. in length; or sounds 32ft. tone. Two octaves below 8ft. pitch (see 8ft. pitch).
- Thread.** The worm of a screw or tapped wire.
- Throat of a pipe.** The deep cut in the block (of a wood pipe) which forms the wind passage.
- Throb.** To pulsate, wave or beat.
- Thumb piston.** A combination or composition movement operated by the thumb of the performer.
- Thumper.** The weighted and felted spline against which the keys hit when they rise.
- Thumping-rail.** A thin wooden spline edged with leather, and sprung into position in the wind-chest about an inch below the free ends of the pallets, to prevent undue movement.
- Timbre.** (Fr.). Quality of tone.
- Tin.** Although so described is slightly alloyed.
- Tompion.** A stopper.
- Tone.** Quality of musical sounds. In pitch, 8ft. tone, 16ft. tone, is used to distinguish stopped (half length) pipes from those of full length.
- Tongue.** A piece of metal to tune by—a vibrator. The strip of wood inserted in a groove in jointing.
- “Top.”** Stops of high pitch.
- Touch.** The depth of depression, and resistance of the key.
- Tower.** A group of pipes in the front, in the form of a turret or tower.
- T Pedal.** A reversing pedal (applied to Couplers).
- Trace.** A rod which pulls, as in drawstop action.
- Tracker.** A light wooden rod which pulls.
- Transept.** The transverse portion of a cruciform church or cathedral.
- Transmission.** (See “Casson’s system.”)
- Treble C.** The octave above middle C (open pipe 12in. in length).
- Treble side.** The side adjacent to the treble of the manuals.
- Tremulant.** (See “Tremulant.”)

Triforium. The gallery or open space between the vaulting and the roof of the aisles of a church or cathedral.

Trundle. A large roller used in drawstop action.

Trundle and lever. A movement usually applied in draw-stop action.

Trunk band of bellows. The lower rim of the reservoir to which the wind trunks are attached.

Tube. The body of a pipe, a part of the pneumatic work.

Tube of a reed pipe. The part corresponding to the body of a flue pipe.

Tubular. By means of a tube or tubes.

Tubular pneumatic Action. See "Actions."

Tumbler. A movement which turns or rolls.

Tumbler coupler. See "Couplers."

Tuning cone. A tool for tuning metal pipes.

Tuning horn. A tool or double cone for tuning metal pipes.

Tuning knife. A tool for tuning reed pipes.

Tuning slide. See Cylinder.

Tuning wire. The hooked wire of a reed pipe by which the tuning, or length of the vibrating portion of the tongue, is adjusted.

Turbine. A fan or wheel driven by water or wind.

Turret. An ornamental tower-like continuation of casework upwards.

Tush-nailed. Nailed diagonally.

Twangy tone. Harsh or brassy tone, generally applied to Reed stops.

Two feet C. The pitch of an open pipe of about that length.

Two-feet pitch. Two octaves above 8ft. pitch (see 8ft. pitch).

Unequal temperament. The unequal distribution of the pulsations in tuning.

Upper-board. The board in which the feet of the pipes stand.

Upper-board of bellows. The top board upon which are placed the weights.

Vacuum pull. The power created by exhaustion of air.

Valve. A flap which admits and cuts off wind.

- Venetian swell.** Consisting of a number of louvres as now usually made.
- Ventil.** A valve letting on or cutting off wind to a wind-chest.
- Ventil key.** (See Buxton organ.)
- Vibrator.** The tongue producing the vibrations in a reed pipe.
- Voicing.** The art of adjusting the portions of the pipe which produce the tone.
- Warp.** To bend, or twist.
- Washer.** A metal collar.
- Waste, or waste-valve of bellows.** The flap or valve which discharges surplus wind.
- Wave.** A pulsation, throb, or beat.
- Wedge coupler.** See "Couplers."
- Weighing the wind.** Ascertaining the pressure by means of an anemometer.
- Weight of coupler.** The additional resistance of the key when the coupler is in action.
- Weight of touch.** The amount of pressure necessary to depress the key or keys.
- Wind.** Usually regarded as air in motion, but in organ matters as air under pressure—either in motion or stationary.
- Wind bar.** A longitudinal bar in the wind-chest.
- Wind-box.** That portion of the wind-chest which contains the pallets, as distinct from the channelling.
- Wind-chest.** The chest or box enclosing the pallets. Also applied to immediate portions as a whole.
- Wind guage.** See Anemometer.
- Wind pressure.** See "Pressure of wind."
- Wind-trunk.** The large tube which conveys the wind from the bellows to the wind-chest, (generally of wood).
- Windway, of a pipe.** The narrow slit or opening in a pipe between the block or languid and the cap or lower lip.

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(REFER ALSO TO THE VOCABULARIES.)

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ADDENDA.

POSITION OF ORGAN.

Page 1, line 10. Heat makes the air in a pipe lighter, causing the vibrations to beat quicker, therefore they reach the top of the pipe sooner, sharpening the pitch.

THE BELLOWS.

Page 3, line 11. In old instruments only a single feeder was used, which, if carelessly operated, caused unsteadiness of wind. Modern organs have double feeders, which, though much better, have the disadvantage of the lever knocking, if at all slack, owing to the reversal of strain on the lever pin or bearings. Single-feeder bellows are free from this fault. In some good instruments three feeders are used, which give a very steady supply from a three-throw crank, and avoid the knocking caused by reversion of the pressure, as in the usual up and down stroke of the blowing lever. With the ordinary double feeder, the use of cranks would prevent knocking.

Page 7, line 13. The noise of gas engines may be partly remedied by providing for the exhaust a concrete pit filled with rubble, covered by flag stones cemented down, and having a relief pipe.

Rotary fans, or cylinders, can be used for supplying wind. Reservoirs can be of the gasometer type.

SOUND BOARDS AND WIND CHESTS.

Page 8, line 26. It would be advantageous in many ways if organ builders would make the wind box a few inches deeper.

PALLETS.

Page 12, line 7. If pallet holes and wind channels are of insufficient size, or the pallets open insufficiently, the wind is so much weakened when the full organ is going as to throw the organ out of tune, although individually the stops may be in tune. Robbing also throws certain pipes or stops out of tune.

ACTIONS.

Page 15, line 27. In action work, rollers sometimes serve in a similar way to backfalls, one arm being in the opposite direction to the other, passing through a hole made for it in the roller board.

Back buttons in action work are those which do not assist when the key is depressed, but are desirable to keep the various parts of the action in position, and assist, if required, in returning the action.

In mechanical action work it is best for the parts to be in balance as far as possible; if the pallet spring has to *lift* the weight of the action, the spring must be strong, and more unyielding than is desirable.

Tracker action is cheap, reliable, and lasting; but its greatest charm lies in the *personal control* of the pallet by the player.

PEDALS.

Page 22, line 15. In a two-manual organ by Bishop and Son, the height of the Great manual from the pedals is 29 inches, instead of 32 inches as laid down by the Resolutions of the R.C.O.; but the pedals are certainly comfortable to use. In three-manual instruments they must be placed farther down from the Great to allow room for the Choir manual.

COMPOSITION PEDALS.

Page 22, line 27. Single-acting composition pedals act in one direction only, either drawing, or shutting off certain stops.

FROM BELLOWS TO PIPE.

Page 25, line 13. Grooves are cut when the pipe stands on the same upper board as covers the slide; convey-

ances are used for other positions, as from one upper board to another, or to front pipes, or pipe blocks.

COUPLERS.

Page 28, line 28. In pneumatic work, coupling can be done "in the wind."

SWELL PEDAL.

Page 31, line 9. Frequently the motion of Swell pedal rods is transferred laterally by thicknessing out the rod; this apparently simple device is apt to give trouble, as, if no guide exists, the rod is liable to trend diagonally, and cause the shutters to grind on their ends. The motion is better rollered off. Provision must be made for the sweep of the rod.

Page 32, line 5. In order to allow the swell to close properly it is best to cut away sufficient of the swinging rod above the top notch to ensure freedom of the pedal.

THE PIPES.

Page 35, line 2. The upper lips of large metal pipes should be "inserted" until the pipes are sufficiently small for the metal to be "dressed." Zinc may be used for all pipes of metal stops—except Reeds—below 4ft. C. The ears of metal stops should be carried through in the smaller scaled stops, and should not be discontinued too low down in pitch in the smaller pipes of other stops as they affect the quality of tone.

The earing of Open Diapason and Principal pipes is usually continued to 12-inch C, and sometimes to the F above.

Heavy pressures and small scales imperatively demand ears to pipes.

Stoppers of wood pipes are of wood covered with leather; for metal pipes the stoppers are better covered with cork, which grips well—india-rubber rings circular in section snapped into a semi-circular groove turned in each stopper have also been tried, but cork is better, especially as a large area of surface in contact with the pipe is desirable. Stoppers of all kinds give trouble in hot climates. Inverted canisters (metal caps) bushed with leather stand well.

PRESSURE OF WIND.

Page 35, line 10. The pressures of wind for the Reeds at the recent rebuild of the organ at St. Paul's Cathedral have been raised: Great Organ Reeds 7 inches, Contra Posaune 32ft., 6 inches, Grand Bombarde and Clarion 20 inches. The new Tuba in the dome is on 20 inches for the bass, and 25 inches for the treble.

(The Vox Angelica in this organ consists of three ranks of Gambas having different beats).

The Altar organ, both flue and reed (Vox Humana), is on 4in. wind.

Page 36, line 8. The Contra Posaune 32ft. has always been on 6in. wind.

Of pressure of wind and flue pipes it may broadly, and subject to certain conditions, reservations, and exceptions, be said: High pressure, high mouth; Low pressure, low mouth; High pressure for power; Low pressure for quality of tone. Soft tone, good quality; Loud tone, hard quality. Low pressure, soft tone; High pressure, loud tone. High pressure for reeds. Low pressure for flues. Low mouth for string tone; high mouth for flute tone. Small scale for string tone; large scale for full tone. Low pressure, small scales. High pressure, large scales. What is gained in power is lost in quality, and *vice versa*.

High pressure, wear and tear. Low pressure, long wear.

Increase of pressure of wind throws the organ out of tune; sharpens the pitch; causes wood pipes to chuff; metal pipes to blow into the octave above; affects the tone of delicate stops, and the pitch of stopped pipes; but improves the quality of the trebles of Reeds.

When several pressures of wind are required, a device in a box inside the reservoir, called a rolling pallet, is controlled by the upper board of the reservoir, which closes the pallet by pulling a tape when the reservoir is full, thus reducing or cutting off the supply of wind.

MANUAL FLUE STOPS.

Page 40, line 7. In old organs the mouths of Open Diapasons were very low and wide, the upper lip was triangular and flat, the pipes sometimes had no ears, but the

pressure of wind being low, and the scale fairly large, the tone produced was full and round.

Page 41, line 9. Modern Gedacts and Flutes have long bored stoppers, the length of the hole in the stopper being calculated to give a prominent harmonic to the ground tone of the pipe, a scientific development of the old metal Flute à Cheminée, which was always breaking off. Stops of harmonic nature (although beautiful in tone) cut through the ground tone of the organ so much as to appear to weaken it, and at the same time they add very little body of tone in the full organ. This is especially the case with harmonic flutes.

Page 41, line 27. The present method of tuning Gambas by means of the slide or roll of metal at the slot is apt to alter the character of tone by reason of the correct proportional length of the slot being upset in tuning, and it would be better to always use lapped slides, and, instead of the slide shortening or lengthening the slot by covering or uncovering, as is now customary, have the properly proportioned slot at the correct distance down from the top of the pipe formed in the lapped slide, and the actual pipe cut so much shorter. The tuning could still be effected by means of the lapped slide, and the correct position and length of the slot would always be preserved. This, of course, refers to the smaller pipes. But a metal pipe maker would say that if the pipes are properly set out and made, the proportion of slot comes out right, and long lapped slides might chatter.

PIPE SCALES.

Page 54, line 17. The scale of Mr. Hope Jones' Viol d'Orchestre is only $1\frac{1}{8}$ inch at CC.

The scale of the Principal should be one pipe smaller than the Open Diapason, and that of the Fifteenth one pipe smaller than the Principal.

Modern voicers believe in making pipes speak up to their full strength, and arranging the scales to suit this principle.

THE TREMULANT.

Page 55, line 7. Small stopped pipes are very sensitive to the tremulant. Reeds also tell well when they are capable of standing the action of the tremulant.

QUALITY OF TONE.

Page 60, line 14. Organ tone may be classed under four heads—

Diapason tone	}	Flue work.
Flute tone		
String tone		
Reed tone		Reed work.

Modern voicing almost supplies another heading--

Harmonic tone.....Flue work, or reed tubes.

BALANCE OF TONE.

Page 62, line 10. For variety, good quality of tone and power, a large number of soft stops is preferable to a small number of loud stops.

Bright tone for rapid runs: medium tone for moderate pace: heavy tone for loud slow music.

Peculiar tones are of no use for chorus work, except as colouring.

Power must be proportionate to vocal or instrumental requirements, situation, or size of building—that which appears to be loud in one building is soft in another.

DEFECTIVE TONE.

Page 63, line 25. May be caused by an escape of wind from the channels (underneath) through the bursting of the parchment, or other covering; or from the channel or pipe foot having been bled, lowering the pressure.

Windy tone is the result of some error of the languid; too wide a windway; the nicking being too deep; escape of wind at the foot, or conveyance; or from the pipe foot or channel having been "bled." If the bleeding was done to stop a pipe from being sounded by running wind it would be done in the foot of the pipe, and that pipe only would be affected with windiness, but if it was done to stop ciphering (through the pallets) the probability is that the parchment, or covering of the under side of the channels, would be stabbed, or bled, affecting that note of all the stops on that wind chest.

Page 64, line 6. Too much wind causes unsteadiness of tone; power; and sharpening of the pitch. Insufficient wind causes the tone to be too soft, and lowers the pitch.

Reducing the power of a stop by contracting or plugging the wind holes of the pipes necessarily lowers the pitch; this is corrected by shortening the pipes, using the means provided for that purpose, or by cutting the pipes shorter.

Softening a pipe is effected by giving it less wind at the foot. This is done, in the case of metal pipes, either by cupping, or lightly tapping round the edges of the wind hole so as to contract its size, and in the case of wood pipes by plugging the foot. Enlarging the wind hole makes the pipe louder. The whole organ can be made louder by adding pressure to the bellows, but this means work and tuning, as the wood pipes will soon begin to chuff as the pressure increases; and Dulcianas or any small scaled or delicate stops are very sensitive to over-pressure. Such alterations, however, must not be lightly undertaken, as they involve expense and trouble, especially if the result is unsatisfactory. (See paragraph farther on referring to Fine Tuning, page 102, line 2.)

For lowering the pitch of an organ (or stop) use lapped slides for the metal pipes, or, if space permits, transplant the pipes a semitone *upwards*, adding one new pipe at the bottom of each stop, and doing away with the top pipe. Or possibly the keys could be shifted downwards, and the wind chest be lengthened at the bass end for the new pipes. (See Alteration and Re-construction.)

A low mouth, thin lip, shallow nicking, or narrow windway, is apt to give a weak tone.

Barking or chuffing is due to want of truth in the lips or windway, or to the nicking not being sufficiently deep.

The position of the languid in ordinary pipes should be such that the wind is directed (and splits, or rather acts) upon the upper lip: if too low, the wind flows inwards; and if too high, it flows outwards.

For string tone, the wind requires to be directed more towards the outside of the pipe than for flute tone, which requires the wind to be thrown inwards. Mark Wicks' "*Organ Building for Amateurs*."

The caps of wood pipes are hollowed or shaped internally to achieve the desired direction of wind, and in wood pipes of string tone the block is more like a languid, adjusted at an angle, and sharply bevelled at the windway.

A high mouth causes hollow tone: a low mouth causes over-blowing, or gives string tone. If the mouth of a pipe is too high, the wind may fail to "reach" the lip sufficiently to give the proper tone.

If the languid is too low, the note may be fluty, or over-blow into the octave; if too high, the speech is slow or stringy. The languid can be carefully depressed with anything thin and flat, or can be gently raised by (or tapped with) a stout wire passed up through the wind hole.

Alterations of windway in ordinary wood pipes have to be done in the caps. Widening the windway of the cap directs the wind inwards, and *vice versa*.

In reed stops, the truth and curvature of the tongue are all-important factors: if the amount of curve is too much the tone is loud, and the speech slow: if the curve is too little the speech is quick, but weak. If too nearly straight it rattles.

In all cases it is best first to inspect pipes of good speech, and proceed with the greatest possible care, or the pipe may be spoiled.

Page 64, line 17. Old metal pipes are often so much out of shape, (especially at the top), that the tone is unsteady. Dress the pipe into its proper shape, and, if necessary, lengthen it, or use a lapped slide.

Page 65, line 6. The shoulder of the pipe hook should be a quarter of an inch clear of the rail, to allow for possible sinking of the pipe.

ESCAPE OF WIND.

Page 65, line 26. In obstinate cases of valve-curling, well-seasoned wood or possibly metal may be glued or cemented to the leather to prevent it.

REGULATION OF ACTION.

Page 68, line 25. Or, the button may be held fast, and the sticker be turned in the contrary direction.

Page 68, line 29. In regulating Manual to Pedal couplers, the buttons should be turned just sufficiently to take the manual key well down, and then be eased back if required, so as to leave a trifle of play or shake to the manual

key when the pedal is fully down ; otherwise, if the coupling action is too tight, something may strain or break ; the coupler may partially act without having been drawn ; or push up the tail of the manual key when drawn, and cause ciphering. All coupler actions are apt to cause ciphering when drawn and used if the regulation is too tight.

The pedal touch (or its action) must be deeper than the manual touch, or when the manual to pedal coupler is regulated up and drawn, the back sticker is apt to push up the tail end of the manual key, and cause ciphering, or unevenness of the keys.

CIPHERING.

Page 70, line 28. Ciphering may be caused by the threaded portion of a tapped wire being tight or caught in the hole through which it passes ; by the lack of back buttons, or buckling of the pull down connection.

MEMORANDA.

Page 73, line 18. An organ stands better in tune when in constant use, as the dust does not accumulate in the pipes so readily, being blown out as it arises.

The pipes of an organ should be taken out and carefully cleaned about once in seven years. (Some say five years for town organs.)

Never attempt to sweep the dust from the upper boards whilst they are in position, as (the pipes being out of their holes) the dust and dirt will find its way through to the pallets, and cause ciphering ; but when it is necessary to clean the upper boards, draw the screws, and lift the boards, dirt and all, and take them away from the organ to clean, blowing out the pipe holes and groovings with a pair of ordinary house bellows.

Holes will be found in the rackboard over each screw, and if a screw has rusted, put the screw-driver through the hole in the rackboard and into the head of the screw, and give the screwdriver a few smart taps on the end of the handle ; this will start the rust, and allow the screw to be drawn. Use a round screw-driver. The slides can be easily lifted off and cleaned, and the table carefully dusted, so as not to put grit through the holes. The pallets

will require to be swept. When replacing the upper board after cleaning, try each drawstop, and if you have screwed any of the slides too tight, ease the screws over those slides, but have them as tight as they will bear, to draw fairly easy. Before putting in the pipes again, blow out the dust, by drawing the stops, putting in the wind, and holding the keys. This kind of thing is organ-builder's work.

To draw a screw which has rusted in is difficult. Proceed as just described or heat a heavy piece of rod iron, or a poker, and hold it to the head of the screw. Saturate screws in metal work with paraffin, and leave it to soak in.

Ratchet screwdrivers are handy for light organ work.

Metal conveyances should be properly numbered in the order in which they succeed each other, and also be marked with the name of the note at the sound-board end, which also should be marked, together with the wood block upon which the pipe stands.

As conveyances frequently cross each other, those underneath must be put into position first ; these have necessarily shorter return ends than the ones which overlap them. Frequently the right conveyance will seem to fit when the wrong end is inserted, but it will probably be found that it prevents other conveyances going in afterwards, or, more likely still, crosses or covers up other *pipe* holes in the upper-board. This should be guarded against, or the pipes cannot be inserted, which may not be discovered until late.

The seam of a metal pipe is always at the back, and the abbreviated name of the stop to which it belongs, and its note is marked on the front of the pipe (except in front pipes).

The pipes of mixtures are marked with the number of the rank to which they belong.

In old organs the A sharp pipes are sometimes marked B, (for B flat,) and the B natural pipes are simply marked with a natural.

Before inserting pipes, it is best to sort them out, and lay them in order.

Either diluted sulphuric acid, or spirits of salts and bath brick are used for polishing zinc pipes. After well washing

off and drying, the pipes are finished with whiting and a leather. But even diluted sulphuric acid needs care in handling, as it will dissolve (or eat through) almost anything.

One need not be at all surprised if the ordinary organ of the future should be found to consist chiefly, of say, half-a-dozen or more ranks of pipes, representative of the various qualities of tone and degrees of power, each having a compass of seven octaves. This organ would possess the usual three manuals of five-octave compass, and pedal of thirty or thirty-two notes: and each rank of pipes should be available upon any manual in three pitches (16ft., 8ft., and 4ft.); also upon the pedals in two pitches (16ft. and 8ft.). Each stop would have to be available both independently and collectively. No couplers would be required. The resources of such an instrument would be surprising. Having three manuals, very little accessory control would be required. In a word, there are the ranks of pipes for the organist to make use of in any way he desires. But he would have to understand the subjects of balance of tone, and octave duplication, or the indiscriminate use of such an instrument would be disastrous to tonal effects. Each pipe would require a separate pallet, but one only, to avoid any unsteadiness through being supplied with wind from two or more sources at the same time.

Sound seems to *ascend*: this is probably due to reflection (from below).

To test the voicing of delicate stops, try light and rapid repetition of the key, especially if the action is of the tracker description.

If at any time it becomes necessary to enlarge any of the holes for the pipes, or other similar operation, keep the wind on whilst it is being done; this will blow the chips outwards as they arise.

A squeaking noise is sometimes made by the iron registers or regulators of bellows, also by the movement of concussion springs, or other similar contrivances. Grease them with Russian tallow.

Creaking of bellows may sometimes be stopped by shifting the position of the weights a little, especially if the

bellows are out of level. If unsuccessful, try a little French chalk—not oil, or the glue will give way.

A disagreeable whistling often occurs by reason of a short portion of leather becoming unglued, which, being free to vibrate, gives forth a sound.

Pallets and front boards of wind-chests will rattle and jar, give forth a reedy note, or act as a tremulant, if on the balance of adjustment, and neither tight nor free.

Dr. Hinton, in his "*Organ Construction*," states that an open pipe as short as two diameters will speak; also that small wooden pipes can be sharpened by planing them thinner.

The aggregate pressure of a number of springs upon a spring rail is much greater than one imagines. It is the clear perception of (and provision for) the effect of sum totals (as in wind consumption, and tone) that distinguishes the master.

In planning a fairly large organ it is always wise to provide for one spare slide to each manual windchest. But if the holes are bored, the class of stop should be decided upon first.

The top boards of heavy pressure reservoirs have special guide rods. In heavy pressure work some means must be taken to prevent the smaller pipes from being blown out of their holes.

The ill effects of dust in an organ can be got rid of, but damp is ruination.

Hiles' "*Catechism of the Organ*" gives much information as to Continental organs.

Highly decorated organ fronts are seldom of best quality spotted metal. Paint and putty hide a multitude of sins.

Never force or grease any movement to *make* it work, but get it to work first without such aid. Remember that grease clogs after a time.

Study well first principles.

Modern slot-screwed joints in wood-work possess many advantages. They are easily made; the screws are hidden; they allow of a kind of *rubbed* joint; they can be tightened if required; they are strong, even before gluing; after having been glued the wood can be handled or cleaned

off at once; and the joint being held by only a small portion of the wood on either side, opening of the joint by shrinkage is reduced to the smallest possible chance. The process of slot-screwing is this: An ordinary screw is driven in the centre of the thickness of the wood to be jointed, to within, say, half-an-inch of the surface; a hole sufficiently large and deep to admit the head of the screw is then bored in the corresponding piece of wood which is intended to be joined to it, the hole being about an inch or more to the right or left, and a slot, say, five-eighths of an inch deep, and slightly larger than the diameter of the stalk or shaft of the screw, must be cut an inch or more in length from the hole, in the direction necessary to bring the ends of the wood flush, or as may be required. Then the joint can be put together without glue, but with the cramp on if desirable, and the wood be driven endways into position with a hammer, the sharp edge of the head of the screw cutting its way along the lower part of the slot as it proceeds, forming a kind of dovetail. The wood may now be driven back and taken apart, and, before gluing, the screw may be given half a turn further in. Two screws are usually sufficient for a joint of four feet in length.

Mr. Pendlebury asserts that a metal pipe (which is round) produces secondary harmonics, whereas a wood pipe (being square or rectangular) does not. Therefore a wood pipe gives the effect of a mutation stop in itself, and has the advantage (unknown to mixtures) of keeping in tune. In addition to this, wood string-toned stops consume only half the quantity of wind that metal stops do. [But what would rectangular metal pipes do as to tone?]

However that may be, experienced voicers, with certain reservations, do not believe that the *material* of which pipes are made influences the quality of tone to the extent usually stated, as it is the *column of air* which vibrates.

Mr. Pendlebury also advocates the Gedact (stopped) tone in the Great Organ instead of the usual Open Flute tone (Clarabella) in order to obtain a more properly proportioned admixture of harmonics (stopped pipes providing the odd numbered harmonics). This is a reversion to the old style of organ building, (Open Diapason, Stopped Diapason, Principal, etc.) and is probably correct.

Triangular pipes have the advantage of taking up very little room laterally, as they accommodate each other when placed in the usual position.

Robertson gives the series of partial tones, and *ratio of vibrations*, very clearly.

Ratio of Vibrations.

1. Unison.
2. Octave.
3. Twelfth, or octave fifth.
4. Fifteenth, or double octave.
5. Tierce, or third to double octave.
6. Nineteenth, Larigot, fifth to double octave.
7. Minor seventh to double octave.
8. Third octave.

(The next two partial tones would be respectively the third and fifth above the third octave). Mr. Robertson suggests the primary as the first harmonic or partial tone, so that the name of the partial and its vibration ratios agree.

All harmonics above the eighth may be considered as mere noise (*Robertson*).

Undertone is the result of periodically recurring coincident vibrations of two pipes of differing pitch. Thus, a 16ft. pipe produces 64 single vibrations per second, and a 10 $\frac{2}{3}$ ft. pipe produces 96 single vibrations per second. When sounding together, 32 of these vibrations are coincident, and become reinforced or accentuated. Thirty-two single vibrations per second yield a note an octave lower than 64 single vibrations per second (16ft. pitch), therefore these reinforced or coincident vibrations produce an acoustic 32ft. effect (16 complete vibrations per second). The term used for this class of tone (or effect) is resultant.

The beats or pulsations in *tuning* are the throbs of the comparatively infrequent (or occasional) accentuations or reinforcements arising from the coincident vibrations of two tones sounding together in non-multiple and inaliquot (and therefore conflicting, antagonistic and dissonant) measure or relationship to each other (unjust intonation), the consequent clashing of the upper partials of the two tones adding to the dissonance.

When far removed from aliquot relationship the beats are of a distinctly dissonant nature. Remote upper partials are also similarly dissonant, and of both beats and partials it may be said that the larger the aliquot part the greater the consonance, also that as aliquot relationship (consonance or just intonation) is approached, dissonance decreases. The farthest remove from consonance is at the distance of a semitone.

Resultant tone is therefore the humming or musical effect of (sufficiently rapid) recurring accentuations or reinforcements arising from the coincident vibrations of two tones (a fifth apart) sounding together in multiple and aliquot, (and therefore consonant) measure or relationship to each other (just intonation). The upper partials also being either aliquot parts, or at least in order, amalgamate. Resultant tone does not come into existence until the dissonant tuning beats cease, thus beginning where (or when) the other leaves off.

Resultant tone being of a secondary nature,—the reinforced vibrations being *comparatively* infrequent (slow), viz., an octave below the lower of the two prime tones,—the power of tone is very light, being merely a hum, possessing, of course, no harmonics of its own, *being actually derived from* the first two *upper* partials of the note of its pitch.

When tuning beats cease, the notes are said to be in tune (just intonation).

Vibrations may be reckoned as either complete or single, two single vibrations completing the return to the starting point.

It is the lack of multiple and aliquot relationship which gives edge to harmonic combinations in equal (even) temperament, and gives the (more or less) dissonant effect.

In the Sub-bass but little is heard beyond the primary note, the pitch of which is quite uncertain; whilst the octave in the (properly voiced) Violone is so strong that the pitch can well be recognised right down to the bottom of the scale. The richest sounds are those which contain the first six partial tones well distributed, the absence of the even tones, or predominance of the odd ones, always producing a peculiar effect. Helmholtz mentions that in a Gamba or

Geigen all the partials up to the sixth are strongly developed ; but for a Diapason they were only recognisable up to the fourth. Gedacts give only the odd harmonics.—Robertson's "*Organ Building*."

Pipe metal is cast in sheets, and planed, before being made up into pipes.

A peculiarity of stops of the Quintadena class is that both tones (ground tone and twelfth) can be distinctly heard sounding at the same time from one pipe ; and by increasing or reducing the pressure of wind, the upper or lower note is made the more prominent.

Best Scotch glue should be used for organ work.

Harmonic stops are designedly overblown.

Pianofortes are sometimes used in conjunction with the organ, but variations of temperature affect the pitch of the two instruments in opposite directions, heat sharpening the flue work of the organ, and flattening the piano.

Pipes are generally placed so that the mouths have the advantage of the greatest speaking room : some builders face the mouths of metal pipes a trifle diagonally, but not sufficiently so to cause the adjacent pipe to shade the mouth.

In some of Mr. Hope Jones' metal stops, the pipes have very long feet, which are said to influence the tone.

String tone can be produced from wood pipes.

Stops intended to be placed inside a swell box are voiced louder than they otherwise would be.

Swell Reeds should stand in this order : Contra Fagotto, Cornopean, Hautboy, Clarion, and it is usual to place reed stops over the pallets, to secure plump wind.

Try to follow in your mind *all* the results of putting the wind in, drawing a stop, and putting down a key ; the sum of these is much more than one imagines, embracing such matters as harmonics, sound waves, reflection, absorption, etc., etc.

Zinc is much used for export orders, as, apart from its lightness and economy, this material is well suited to stand long journeys, and even in the lower octaves of Reed work tonal objections have been overcome.

Open Diapason tone is said to lose character by being enclosed in a swell box.

Large pipes planted chromatically sympathise, and are said not only to spoil the tone of each other, but to upset the tuning. Nor should two stops of the same *length* be planted next each other.

In gluing leather observe the following rules :—

1. Cut a paper pattern if necessary.
2. Cut the leather as nearly to the size as possible, allowing for folds, etc., remembering that it stretches considerably when damp, but shrinks tight in drying. Gussets require to be snipped where the ribs fold together, or the leather puckers.
3. Have the glue hot and not too thick. (Le Page's liquid glue may be used if handier, but it sets slowly.)
4. Have a sponge ready dipped in hot water.
5. Do not glue moving or folding portions not in contact, or the glue will crack up in sections.
6. Damp the smooth side of the leather before gluing, and afterwards smooth out all wrinkles (preferably from the centre), with a sponge, wiping off all superfluous glue.
7. Glue the rough side of the leather, (except for pallets, etc.,) and, if required, pare down the edges (on the rough side) to the form of a feather edge.
8. Glue both leather and wood where possible ; both should be clean, and the wood dry.

Organ leather is known as sheepskin, and is specially prepared for the purpose, without salt.

Manual pallets are numbered in their order of succession in the wind chest.

The bevelled fillets of wood on either side of pull down wires are to protect them from injury.

Let someone else try your organ, then see if you can name the combinations of stops made use of.

In voicing, it is not the mere sounding of the pipe or reed which is difficult to achieve, but the correct proportion and admixture of harmonics.

Voicing and tuning go together.

The upper lip of a wood pipe should be as high as it is wide, and the face of the splay should be in a line with the windway of the pipe.

If a key rattles through the pin holes having worn large, bat pins, or larger pins, may be introduced ; or a slight

stab may be made on each side of the pin mortise in the key, and small wedges be driven in to make the mortise narrower.

Bushing a hole is effected by *pointing* the cloth after cutting it to the requisite width, drawing it through the hole, gluing it, and passing the wire through afterwards.

The hollow tone of stopped pipes is due to the presence of only the odd harmonics and few of those. In these stops a slight deviation from accuracy as to pitch does not strike the ear so readily as in keen or string toned stops.

A good average rule is to make the Pedal Open Diapason three pipes larger than the first Manual Open, and any second Open three pipes smaller. — *Robertson*.

Keep tallow candles or Russian tallow in *tins*, so as not to attract mice.

Stearine or composite candles are good for lighting purposes, but useless as grease. Organ builders use tallow candles for both purposes. Salt grease rusts metal.

A pair of ordinary house bellows is a very useful article for cleaning the inaccessible parts of an organ.

Some of the economies of the organ are: Light wind; tracker action; stopped pipes (requiring but light and little wind); making use of speaking pipes to form the front or case: plenty of *space* above and around for speaking room; making the swell to open as wide as possible; coupling movements; and zinc pipes.

The extent of the rise and fall of a tell-tale weight can be altered by varying the angle of the cord from the bellows to the pulley. Attaching the cord to the far end of the bellows diminishes the extent of the travel.

A clear air-tight hole can be formed through a wind trunk by gluing in an ordinary wooden pipe foot, or tube.

Organ builders are very ready in practical matters, and contrive all sorts of clever little dodges, some of which involve problems of a highly scientific nature.

A cheap (?) organ is very often good money thrown away. As parsons say of religion, That which costs nothing is worth nothing.

Dr. E. J. Hopkins is the standard authority on all matters relating to the organ.

FINE TUNING.

Page 95, line 11. Bear in mind that as the tuning of octaves and unisons approach perfection the *power* appears to decrease, dissonance being virtually power. This knowledge is especially useful in tuning Reeds and loud or deep notes, as it gives one a good clue: *i.e.*, the less power the nearer in tune. Very often a light additional tap of the tuning wire in tuning Reeds of low pitch will appear to lessen the power, even after the note was thought to be in tune. This shows how easily one may be misled by the ear in tuning octaves or unisons unless checked by reliable tests (fifths and fourths).

Page 101, line 13. A. J. Hipkins, Esq., the eminent authority on Musical Pitch, kindly writes:—"Metal tuning forks flatten almost imperceptibly as the temperature rises.

. . . I recommend that all organs should be tuned to $A=435$ ($C=517.3$) vibrations per second at 59° Fahr." (This is equivalent to $A=439$, or $C=522$ in Equal (even) temperament, at 68° , the usual mean performing pitch, and is the pitch decided upon by a resolution of the Philharmonic Society, November, 1896). A set of forks graduated for use with a thermometer should be obtained.

Page 101, line 20. It is possible to become thoughtless and tune the wrong pipe of an interval. This, of course, alters a note that *was already right*, and may remain undiscovered until late, if testing is omitted or delayed. If any doubt exists, find the pipe requiring alteration first.

Page 101, line 22. Be sure that the stops required in tuning are fully drawn.

English organ builders usually start tuning from C in laying the bearings.

Page 101, line 25. Tuning cones are of three kinds, viz., turned up in solid brass, with a cone at one end, and a hollow cone at the other, the handle being between the two; ditto in boxwood instead of brass; and a stout hollow cone, of brass, copper, zinc, or sheet metal, brazed or soldered up, something like a candle extinguisher. Zinc cannot be brazed.

Page 102, line 2. Lapped slides, clips, or cylinders, are much better for open metal pipes, and have the advantage not only of preserving the tops of the pipes from injury, but

they also allow considerable latitude as to pitch. In fact, after a stop has been made louder they are indispensable, in order to bring the pipes back to pitch,—the pipes requiring to be lengthened after that process. They are also useful for lowering the pitch to Continental pitch. If properly sprung on the pipe there need be no fear as to the pipes standing in tune. Several inches are required to alter the pitch of a long pipe a semitone, graduating down to a mere nothing in a small pipe, for the same interval.

In tuning, it will be found that under certain conditions, as alteration of temperature, swelling or shrinking of slides, state of cleanliness, etc., some stops sharpen or flatten *en bloc*.

In tuning a Swell organ which is placed higher than the Great, some tuners recommend that the Swell be tuned slightly sharp, as the Great organ (being unenclosed) feels the heat more quickly than the Swell. But this seems scarcely advisable, as the heat will ascend, and ultimately affect the Swell organ.

Page 107, line 12. Some tuners recommend checking everything by the middle octave of the Great Organ Principal. The trebles should be gone through twice.

ALTERATION AND RE-CONSTRUCTION.

Page 112, line 21. If it is desirable to increase the scale of all the stops, the pipes may remain in their proper holes and the keys be shifted towards the bass end, the pipes being cut down to pitch (G organ soundboards).

TO FIND THE SYMPATHETIC TONE OF A BUILDING.

Draw the Pedal Open Diapason, 16ft., and, by trying it up and down the Chromatic scale in the lower octave, find the most responsive notes—those which ring round the building, and have a special sense of fulness—and select the most responsive one. Ascertain, by testing its octave, and its unisons and octaves upon other flue stops, that this filling effect is due to the *sympathy* of the building, and not to any peculiarity in the power, position, or voicing of that particular pipe. Now strike the common chord (staccato) upon the Great and Pedal flue work, and listen to the effect

when the notes are abruptly released. Try the cycle of common chords in like manner, when it will probably become apparent that only the one selected chord of the twelve will *fully* sympathize with the building; the remaining eleven gradually losing their influence in proportion as they recede or remove from the prime sympathetic chord in the usual order of succession of keys, until at last, it almost, if not totally, disappears at the distance of a semitone—the farthest remove by *succession of keys* from the prime responsive chord.

It is doubtful if it is *practically* possible to calculate with certainty the sympathetic tone from the cubical contents and proportions of the building, on account of the presence, in unknown quantities, of very subtle influences, such as reflection, absorption, obstruction, secondary sympathy, etc.

VOCABULARY OF TECHNICAL TERMS.

Aliquot part. A part of a larger given number or quantity, which part is capable of division in the larger number or quantity without remainder.

Arcade. A row of arches.

Back buttons. See "Actions" (Addenda).

Backfall bridge. Backfall beam or rail.

Backfall rail. Backfall beam.

Barking. Chiffing, or having too much wind.

Barrel screwdriver. A screwdriver round in section, similar to those made from mill spindles.

Bind. To be nipped, or hard pressed.

Block. A piece of wood (bored or grooved) for pipes which are conveyanced, or grooved off.

Bracket. A horizontal support projecting from the vertical line.

Bridle. The bridge or link connecting two rollers to work as one.

Buckle. To partially double up, or give way, so as to permanently cripple the correct line or curve.

Butterfly crank. One of special angle to suit diagonal drawstop action.

Button valve. A disc valve.

Cam. A revolving movement shaped to ensure a special line of motion.

Canopy. An arched ceiling.

Casting bench. A table (covered with cloth or bed ticking) upon which pipe metal is run or cast.

Casting box. An adjustable sliding bottomless box used in casting pipe metal, to determine the thickness of the sheet.

Chatter. To rattle.

Comb. The rack-like construction through which the toe ends of the pedal keys pass.

Complete vibration. The outward and return movement necessary to return to the starting point.

Counter balances. The iron registers of bellows.

Cover board. The bottom board of the windchest.

Covered reed. Having a cap.

Crippled. Irretrievably bent out of line ; crooked.

Cutting down. Refers to bringing a stop of pipes roughly into tune whilst in the voicing machine.

Cutting up. Has reference to increasing the area of the mouth of a pipe vertically.

Diaocton. An (upward) octave coupler acting upon the same manual.

Diapered pipes. Decorated pipes.

Disc. A flat circular plate.

Divided stops. Are those which are arranged to draw in two parts, as Stopped Diapason Treble, Stopped Diapason Bass, the latter having a compass of about an octave or more from the lowest note of the manual, frequently forming the Bass (and meeting the range) of another stop of short compass, as Dulciana to Tenor C.

Dolly. A metal stalk having a ball at each end, used in a double ball joint for blowing levers, or where considerable freedom of action is required.

Double valve. Similar in action to a solid valve.

Dressed. Applied to sheet metal shaped by skilled manipulation, or beating.

Dummies. Show pipes which give no sound.

Elevation. A drawing of the front or vertical appearance.

Face. The most important surface.

Family is used in organ work to denote class of tone, and completeness of range or compass.

Feather edged. Pared or worked away to a thin edge.

Fillet. A small strip of wood.

Filling in pieces. The pieces of wood necessary to fill up the spaces at the ends of the (windchest) bars.

Flange plate. A flat connecting piece, as where the wind trunk is attached to the trunk band.

Fluting. A series of hollows side by side.

Gangway. A space for passage.

Groove block. A block of wood grooved for pipes standing away from their wind.

Impost. The horizontal moulding at the springing of an arch, but loosely used for an horizontal feature of casework, as that on which front pipes are placed.

Inaliquot part. A part of a larger given number or quantity which is incapable of multiplication to the larger number or quantity without remainder.

Intersection. The point where lines (of moulding, etc.) at an angle meet each other.

Key cheeks. The woodwork of the key frame adjacent to the treble and bass keys.

Key frame. The woodwork in which the keys are set.

Knocking up cup. A tool used by metal hands (metal pipe makers) for rounding off the terminals of metal tubes. It is of considerable substance, (brass,) and has a kind of handle at the top.

Lapped slides. Overlapping metal tuning clips or cylinders *sprung* on the tops of open metal pipes.

Lug. A block to lift by, as attached to the feeders of bellows.

Movement. Action work.

Multiple. Divisible without remainder.

Nut. A button or tapped collar to turn on a thread or screw.

Pallet brush. A piece of plush glued on the end of a thin strip of wood, for removing grit from the face of the pallets. Fine sand-paper will do instead of plush.

Pallet guard. See Thumping rail.

Pitch C. The 6-inch C of the Principal for pipe work, 12-inch C for tuning.

Pivot. A pin turning on its axis.

Plan. A drawing of the floor space occupied, or the appearance from above.

Planting pipes. Locating their positions.

Plunger. A disc.

Positive or Positif. French term for Choir Organ.

Prepared for. Refers to a spare slide or slides; preparation for future work or insertion of pipes.

Prime Tone or Primary. The chief or ground tone.

Proportionals. A pair of compasses with a moveable centre, used by pipe makers and voicers to determine the height of the mouth in proportion to its width.

Quatrefoil. A four-leaved ornament in Gothic work.

Ram coupler. Practically a drum coupler.

Range. Extent (of compass).

Rebate. A two-sided rectangular formation sunk on the edge of wood, stone, or ironwork.

Reeding. A series of convex surfaces side by side.

Reed knife. A tool, shaped something like a knife blade, used for tuning Reed stops. (See page 46.)

Regulator. The register, guide, or stays of bellows.

Rolling pallet. A pallet (controlled by the top board of the reservoir) to admit or cut off the supply of wind.

Section. A drawing of the appearance when cut through.

Shaft. The body of a column.

Simplification system. The pipes being placed in chromatic order to simplify the action.

Single vibration. A movement in one direction only as distinct from the two movements necessary to make one complete vibration.

- Six-inch C.** The pitch of an open pipe of about that speaking length.
- Slide.** A metal clip or cylinder used for tuning metal pipes. Lapped slide, one in which one edge of the metal clip overlaps the other.
- Sliding coupler.** One in which the register (guiding the stickers) slides forward when the stop is drawn, bringing the stickers into gear or action; or similar coupling movement.
- Slot screwed.** See paragraph in Addenda.
- Solid valve.** A block valve which opens one hole and closes another by the same movement.
- Spandrel.** The triangular space between two arches, or a similar space.
- Spare slide.** One, (together with its appurtenances,) provided for future use and insertion of pipes.
- Speaking pipes.** Those which sound.
- Spline.** A pliable strip of wood.
- Spring.** Elastic force. To yield.
- Spring catch.** A tool made to clasp the legs of a pallet spring, and used to insert or take out springs.
- Spring rail.** The rail carrying the springs.
- Staple.** A metal bridge or link.
- Stock.** The rail in which the drum sticks of a drum coupler are hinged.
- Stop knob.** The handle of the drawstop.
- Stop peg.** The peg or pin in the table of the wind chest to determine the extent of the movement (or shift) of the slide.
- Thickened out.** Made thicker or stouter where required by the addition of one or more thicknesses of material.
- Trefoil.** A three-leaved ornament in Gothic work.
- Tribe.** Class.
- Type** is used to indicate class of manufacture or of action.
- Undertone.** Resultant tone.
- Upper partials.** Overtones or harmonics exclusive of the primary.
- Velvety tone.** A term used to denote soft and full tone.
- V jointed.** Having the edges bevelled so as to form a V when put together.
- Voicing machine.** The essential parts of a small organ, used for voicing pipes.
- Wad.** A collar of felt.
- Well of bellows.** The part enclosed by the trunk band.
- Wind hole** of a pipe refers to the inlet at the bottom of the foot, or boot.
- Winding.** Being wrung, twisted, or not true in plane.

THOMAS ELLISTON,

SIAM HOUSE,

December, 1900.

SUDBURY, SUFFOLK.

ADDENDA II.

Position of Organ.

Any settlement of the floor or platform is likely to give trouble and entail expense. Architects object to the organ being placed on the screen dividing the Nave or Ante Chapel from the Choir or Chapel, on account of the obstruction to the view from West to East.

“Place the organ and choir together.”—*Musical News*.

Bellows.

Manufacturers of reciprocal organ blowers seek to eliminate the reversal of motion in the working parts by so arranging them as to “take up their own wear.” In rotary blowers there is no reversal.

Robertson states that organ builders allow about two square feet per stop in calculating the area of bellows.

An additional allowance must be calculated for in an organ of dignified tone or design, or when sub-octave couplers are included.

Bellows should be double leathered.

It is possibly wise to place the bulk of the bellows weights (as far as practicable) in a line from one counterbalance to another, as although these do not sustain the weights, they give a certain amount of lateral stability in case the top board of the bellows takes to lurching.

The ribs of the reservoirs of bellows should be sufficiently wide in proportion to the amount of rise (which is generally

about twelve inches) to prevent them reaching a more obtuse angle with the top board than 45° , or they will support or take some of the weight, (reducing the pressure) when the reservoir is full.

If *all* the ribs of bellows fold inwards or open outwards, the pressure of the wind from within assists them to sustain some of the weight as they approach the vertical position as the top board of the bellows rises, causing a variation in the pressure. The Austin Organ Company make use of this law, and construct a pressure board in conjunction with a single pair of ribs folding inwards, using springs to give pressure instead of weights, the whole being practically a huge concussion. The variation of pressure arising by reason of the pressure of wind on the ribs from within, and their position, is calculated to be balanced by the variation in the strength of the springs: as, when the ribs are opened and the pressure is naturally at its minimum, the springs exert their maximum power, thus giving compensation. The contention is that the pressure board and springs are more active than weights, and the disturbance from momentum is much less than when weights are employed to give pressure. (Refer to "Pressure of Wind" and "Austin's System"; also to "Escape of Wind," Addenda II.)

In London, Liverpool and Glasgow, water services exist having a pressure of 700lbs. to the square inch, and at Manchester there is one of 1,000lbs. to the square inch.

Water pressure can roughly be estimated at the rate of half a pound pressure per square inch for every foot of fall, with a clear-bore pipe.

An Air Compressor is practically an air pump of metal, and consists of a cylinder provided with valves at the ends, and a piston, crank and flywheel.

Davies' Rotary Blower consists of four weighted V shaped feeders attached at the hinge end to a common hollow horizontal centre or shaft, which receives the wind from the feeders as they fall over in succession in rotating, and delivers it into a wind trunk at the side. Opposite feeders are coupled. The top board of the reservoir controls a

valve in the wind trunk admitting or cutting off the supply ; when the reservoir is full the entrance of the wind is cut off, and back pressure being created, no wind is generated until the valve is opened by the falling of the top board of the reservoir, when the blowing is resumed.

A Compound Centrifugal Organ Blower consists of two or more blowers of this kind coupled in series, the first one generating say four inch wind, and delivering it to the second, which raises it to eight inch wind, and so on. The wind can be tapped or drawn off at any pressure. This method of raising the pressure step by step (instead of reducing it from the higher pressure) is considered to be correct in principle.

The Kinetic Organ Blower consists of a series of fans arranged in chambers side by side. As in the preceding system, each succeeding fan is fed from the chamber below, and adds the pressure generated by itself step by step, throughout a series. In this case also the wind can be tapped at various pressures. In ordinary fans the air is driven in the same direction as the blades of the fan, but in the Kinetic blower it is propelled at right angles thereto ; end thrust of the spindle being eliminated by setting the blades of half the number of fans in one direction, and half in the other. It is said that these fans can be run at a comparatively slow speed ; ordinary fans requiring a high speed.

In the Swanton Economiser the position of the top board of the reservoir does not affect the supply of water to the engine, but varies the leverage of the cranks (without shortening the stroke of the engine) so as to blow fast or slow according to the demand made on the wind by the performer.

It is stated that a very important economy of water results ; when, as is often the case, the water pressure varies.

It is claimed for the Sturtevant silent organ blowing fans that "they are automatic in regard to air supply, for when run at a constant speed they will maintain a constant pressure in the reservoir, irrespective of the volume withdrawn ; the power absorbed by the fan being roughly in proportion to the volume handled, providing always that

the volume withdrawn does not exceed that for which the fan is rated." This is true also of other fans.

Electric motors can now be made self regulating in speed, the electric current being governed automatically according to the demand on the wind in the bellows. Example by Messrs. Bergtheil & Young, London, at St. John Baptist Church, Felixstowe. (Organ by Messrs. Norman & Beard, Ltd.)

In large organs of the older type the feeders are arranged and blown in tiers, the wind being generated at the highest pressure and automatically fed off into the lower or lighter pressure reservoirs. When there are wide variations of wind pressure blown by hydraulic power, separate engines and feeders should be employed for the approximate pressures, as *e.g.* at the Crystal Palace.

"In order to ascertain the size or power of the engine it is necessary to know the size, number, dip, and kind of feeders, (square or diagonal,) wind pressure, water pressure, and number of strokes required in a given time to supply the full organ."—*Organist and Choirmaster.*"

When the feeders are placed at a distance from the organ it is wise to make them draw air from the building in which the organ stands, in order to secure the same temperature.

Fans are apt to raise the temperature of the air or wind.

A "silencer" for eliminating the hum up the wind trunk when fans are used, consists of a large leathern bag filled with horse hair, through which the wind is made to pass.

Soundboards and Windchests.

Short soundboards mean robbing of wind, and crowding of pipes. Long soundboards involve long rollers and action, which old organ builders sought to avoid.

Soundboards are sometimes placed at different levels to prevent the tone of the pipes belonging to one soundboard being obstructed by the pipes of the other soundboard.

Actions.

Long rollers require careful fitting and bridging, as they spring or twist a great deal, (especially when many sliders are drawn,) and the pipes belonging to such notes are usually weak, unless they are remedied in the windage.

Metal roller arms are sometimes turned a quarter of the way round (the flat portion being vertical), the tracker wire being simply threaded through. This is a very simple arrangement, as there are no back buttons to become nipped, but a button must be provided to the pull-down wire for the purpose of regulation.

In pneumatic action the relay system—consisting of two or more motors,—is used, the smaller motor operating the larger one.

In Willis' action heavy pressure wind is used in connection with the relay system. The advantage of using heavy pressure wind is that the motors may be smaller. Sometimes a combination of the pressure and suction systems of pneumatics has been made use of, but is now obsolete. Leakages in the suction system are somewhat difficult to locate.

In the Barker pneumatic-lever action the motors are placed near the keys, and actuate the tracker-work leading to the pallets.

In the Tracker-pneumatic action, tracker-work from the keys actuate the motors which are placed near the pallets, the tracker-work taking the place of tubes.

Organs in which good tracker-work exists can be converted to pneumatic at far less cost than supersession by tubular action.

One advantage mechanical and pneumatic lever actions possess over the tubular action (with the motors inside the windchest) is that they can be seen at work if any difficulty arises.

In tubular pneumatic drawstop action the drawing of the stop opens a pallet in a wind chest by means of a cam, allowing wind to pass through a tube and inflate a motor attached to the slider at the end of the soundboard. When the stop is pushed in, the motor is exhausted, the slide being returned by a spring. In an earlier form, a kind of double external motor was used; no spring being required.

Mr. Casson prefers a double-action motor of the Holt pattern, to a single motor and spring.

In combination piston action a valve in a heavy pressure windchest is opened, allowing wind to pass to a set of

motors, one for each stop: or to a kind of bellows motor actuating the fans of composition pedal action.

Leverage and resistance play most important parts in mechanical action—the longer the leverage, the easier the action. Short leverage (*i.e.* near to the centre pin or fulcrum) results in a hard, grinding or sweeping motion. Balance or equilibrium of parts must likewise be carefully studied. Line and parallelism of centres are also important factors in linked or coupled motions.

Drawstop and Composition Pedal Action.

Adjustable pedals and pistons are now made, but, like the ventil system, they place an additional strain on the memory of the performer, and if altered by a second person without the knowledge of the usual organist, may cause surprise when used.

Mr. Hope-Jones has invented a kind of double touch composition pedal consisting of one pedal above another. If the upper pedal is pressed down sufficiently to depress the lower one, the latter provides a suitable bass to the combination formed by the upper pedal. Each can be used independently of the other, as the lower one slightly projects.

Swell Pedal.

If the cow-heel movement is used with horizontal shutters, the shutter pins should be more nearly in the centre of the shutters, otherwise the increased rapidity of motion (as the pedal descends) added to the increased leverage of the shutters as they open, make the pedal heavy in use as it descends. Sometimes vertical shutters are used with the swinging rod swell pedal. Ex: at Baptist Chapel, Sudbury, Suffolk.

In electro-pneumatic organs the swell shutters open singly in succession.

Thumb Pistons.

Independent pistons (or pedals) should be provided to bring on (or form) the various groups or families of organ tone:—as Diapasons, Flutes, Strings, Reeds.

Pipes.

The upper lips of flue pipes are now sometimes leathered.

When stopped pipes reach small dimensions in the treble, the stop is best continued upwards in open metal pipes voiced to match the tone.

Very little body or weight of tone can be got out of *thin* pipes.

Pressure of Wind.

Wind pressures vary from two and a half, or three inches, to twenty-five inches.

"Every inch of water on the windgauge is equivalent to a pressure of about half an ounce per square inch."—*Robertson*.

Heavy pressure, heavy touch.

Light pressure, light touch.

Large scales for power, and travelling of tone.

Small scales for light and stringy tone.

Choir Organ.

Sometimes a Tuba is played from the Choir manual, to enable the performer to use the Swell or Great for its accompaniment.

Pedal Organ.

Great use is now being made of the extension system, both for Pedal and Manual organs.

A Pedal stop may be continued downwards in actual 32ft. pitch or tone to GGG, or FFFF, the notes below (to CCCC,) being obtained acoustically by coupling in fifths, or the whole of the lower octave may be so obtained; or this lower octave may have *independent* Great Quint pipes, a method introduced by Mr. T. Casson.

Bourbons are sometimes made to speak in two powers, but some compensating tuning device is necessary, owing to the flattening of pitch when the lower pressure of wind is used. In these (and other pipes) the upper surface of the block is sometimes made to slope away down to the back of the pipe, to form an air cushion. Occasionally Bourbons are made in metal or zinc, but they are apt to give trouble by reason of the tompions or stoppers dropping

down. This could probably be remedied by mitring the tops of the pipes to a right angle, which does not appear to injure the tone, and would allow the stoppers to be supported on edge. Or it could be avoided by the use of leather-lined metal caps, with or without "chimneys." Bourdons require the addition of octave flue work, to define the pitch.

Manual Flue Stops.

The scale of the Open Diapason in one of the old organs referred to on pp. 312-313 is as follows:—

CC (modern, zinc,) 5in. Tenor C (an ancient pipe but possibly not the original C) $3\frac{3}{4}$ in. Middle C $1\frac{3}{4}$ in. full. Treble C 1 inch. The height of the mouths (from the edge of one lip to the other) is a full quarter of the width of the mouth, with very thick languids, which give the pipes the appearance of having low mouths.

Pressure of wind $2\frac{1}{2}$ inches full.

This stop is in the organ (rebuilt by Mr. C. Martin, of Oxford,) at Edwardstone Church, Suffolk.

A very ancient organ now at the Hall, Belchamp Walter, near Sudbury, Suffolk, contains some excellent straight grain wood pipes, with very low slightly arched mouths, the stopped bass pipes being cut up only about one sixth. The scale of the stopped CC is $3\frac{1}{4} \times 2\frac{3}{4}$ in. Tenor C, $1\frac{7}{8} \times 1\frac{1}{8}$ in. Mid C, $1\frac{3}{8} \times 1$ in. The reservoir of the bellows is diagonal, and the wind pressure is exceedingly light, being only $1\frac{1}{2}$ inches to $1\frac{3}{4}$ inches, (fluctuating). The stoppers of the pipes are not pierced.

The scale of the No. 1 Open in the organ by Schulze at St. Mary's Church, Tyne Dock, is given by Mr. L. K. Boseley, as $6\frac{1}{4}$ in. at CC, $3\frac{3}{4}$ in. at Tenor C, and barely $2\frac{1}{4}$ in. at Middle C. An exact reproduction of this stop by Mr. H. S. Vincent of Sunderland, has been introduced into the organ at New College Chapel, Hampstead, on $3\frac{3}{8}$ in. wind.

Zinc basses should be of heavy gauge, hard, cold rolled zinc.

Reed Stops.

To eliminate undesirable resonance of the boot of a reed pipe, a hole is pierced in the boot. In a wood pipe, a

larger hole, situate lower than the windway, is covered by a leathern disc, for the same purpose.

The tubes of harmonic reed stops are of double length, and generally have a hole pierced midway.

The curve of the tongue of a reed stop is cycloidal.

If the *shades* of cylindrical reed stops (as the Clarionet), were attached to sliding cylinders like tuning slides, the tubes of the pipes could be easily adjusted for *consonance* as well as power. And those stops which are not cylindrical could be made so for a short distance down from the top of the tube.

Pipe Scales.

Refer to Manual Flue Stops, Addenda II.

Tremulant.

The Tremulant is best brought on by a pedal projecting from the bass jamb, as it is frequently only required for a few bars, and the left foot can well be spared for its use, heavy pedalling being undesirable when the Tremulant is in use, as it is apt to upset its action; besides being indefensible from a musical point of view.

In the Casson Vibrato the beats are slow when the Swell shutters are closed, and increase in speed as the shutters are opened.

Balance of Tone.

A Double Diapason is required to balance a Mixture.

Just intonation gives us the full benefit of harmonic combination—tempered intervals clash.

Tempered discords are not so keen as those of just intonation, as shewn by Mr. Hermann Smith.

Mixtures give a certain result or effect which can be obtained in no other way, but whether it can be called a musical one or not is another matter, and appears to depend upon acoustic conditions and circumstances.

The question of Mixtures—or perhaps to be more correct—*strict* mutation work, *i.e.* fifth and third sounding stops, as used in organ building, provides food for much reflection. Theoretically and acoustically speaking they are defensible;

practically they are thought by some people to be indefensible. Used in solo (or single notes of the keyboard) they are perfection; used in harmony their imperfections are revealed. In just intonation (and common chords) they may be tolerated; in Equal (even) Temperament (especially in chords of the diminished seventh), they simply clash.

They are not considered to be necessary in the Pianoforte, Harmonium or other keyed instrument, nor are they specially represented as strict mutation work in the Band or Orchestra, (unless the clang of the Cymbals is intended to supply their place). Yet the fact remains that clang or clash is sometimes desired, to obtain a special effect. Reeds and organ string tone being rich in upper partials, do not require mutation work. In the Harmonium the upper partials are so unpleasantly prominent as to render it desirable to add a set of reeds of 16ft. pitch very early in the Specification, to act as a counterblast. The fact is, in this matter it is somewhat difficult to ascertain exactly what is best, unless it is an artistic copy, reproduction or reinforcement of the natural overtones or harmonics.

As in the case of upper partials, the ranks of pipes representing them should lessen in power as they ascend in pitch. The power of a Tierce should be exceedingly weak.

The subtle (and apparently incomprehensible) antagonism of the organ and orchestra does not lie in the want of sympathy as regards tone, but in the fact that the temperament of the organ cannot be made to lean towards just intonation, (or to a general agreement as to pitch,) by the performer.

It is better to have a large number of soft stops than a small number of loud stops.

In specification work, or in building up (or reducing) the tone when playing, large gaps in the power, quality, scale and pitch of the stops must be avoided. At the same time it must be remembered that the effectiveness of the organ entirely depends upon the *variety* of all these factors. This is one of the puzzles encountered in planning or building a small organ.

Defective Tone.

May be caused by the upper lip of the pipe and the windway being out of line, or untrue with each other, *i.e.*, twisting or winding.

If by any means the slide is not fully closed, it will fail to entirely cut off the wind, and allow some of the pipes to whisper or speak unintentionally, marring the tone of any other stop which may be drawn.

Escape of wind.

Blackening of leather denotes unsoundness, in other words a leakage or escape of wind.

A subtle and unsuspected cause of a loss of wind may be that the spring of the waste valve is so weak as to allow the valve to flap with any sudden movement of the bellows.

But this cannot happen if the waste pallet opens, as it should do, into the feeders.

The valve holes of bellows and feeders must be subdivided into fairly small compartments, as if the leather is thin, the pressure of wind on the valve over a large hole will cause the leather to cup, and permanently curl, allowing the wind to run out at the edges. If the leather is backed with wood, the valve will clatter, (unless the wood is very thin,) and if it warps or grit gets beneath it, it is liable to hold up the bulk of the area of the valve, and prevent it seating properly. If, in order to give support to the valve leather, the holes are made too small, the feeder will gasp. The only remedy seems to be to have good thick pliable leather, or glue the valves up very carefully in two or more thicknesses of leather.

Sometimes the valves are backed with thin wood for a distance of about half an inch only, from their (free) edges.

Regulation of Action.

In judging the depth of touch with the thumper out, a very slight allowance must be made for its weight when in position, which will make the touch a trifle shallower, also for the season of the year; any later alteration in the depth of touch from climatic causes being thus anticipated.

An obstinate button may be squeezed with the pliers in two directions at right angles to each other, in order to destroy the cohesion of the button to the wire, allowing the button to be turned.

Ciphering.

May be caused by the manual to pedal coupler being so regulated as to lift the manual key too high at the tail end, and cause it to hang or become caught on its centre pin. A similar thing happens when the manual touch is too deep.

If the roller stands at an incorrect angle, the wire may have become caught in the hole of the roller arm, (which, however, in course of time, wears oblong).

Sometimes the back or far end of a pedal sharp becomes pinched against the face of the top rail of the pedal frame when the pedal is put down. This defect will arise after twenty years' use, owing to the tendency of the wear being in that direction.

In old instruments ciphering may be caused by the pin holes of the keys becoming so much worn as to allow the keys sufficient room to chafe each other, or allow the side overhang of the sharp to hold down the natural. Use bat pins.

From a similar cause pallets may chafe each other, or the pallet may have so much side play as to make it impossible to ensure it covering its orifice. To remedy this, alter the direction or steady pins.

Damp or wet weather is a fruitful source of ciphering, causing the keys or backfalls to swell and stick; also by causing a variation in the length of the trackers; those which shorten most being liable to cause ciphering by reason of the pallet being prevented from closing, through the key being held by the thumper, or key slip.

If the uncertain or ciphering notes of a mechanical action are eased, regulated, or attended to during rainy or unsettled weather, they seldom give trouble afterwards.

Subtle disagreeable intermittent noises or squeaks are sometimes difficult to locate, being caused by the rubbing or chafing of some portion of the movement or mechanism which only comes into operation under certain conditions, as the occasional rubbing of the bellows handle or swell

pedal against the casework, or the sudden movement of concussions, or waste valve and spring, etc.

When the windbox is extended far beyond the pallet-tails, ciphering will occur even when the pallet is soundly closed, if, from any cause, wind finds its way into a channel.

Memoranda.

Musical tone is the result of sufficiently rapid regular or periodic vibration—whilst irregular vibration produces *noise*.

The disagreeable effect of major thirds of low pitch referred to on page 83, is probably due in some measure to the clashing of the upper dissonant partials, which can be distinctly heard in sounds of low pitch; but a much greater factor resides in the temperament, thirds being considerably mollified when tuned in just intonation.

Do not accompany one reed stop with another.

Probably the reason why stopped pipes do not give the first harmonic (octave) is that the stopper annuls the speaking tone length of the pipe. The ground tone length of Harmonic pipes is similarly annulled—the tone of such pipes following the common law, that what is gained in one way is lost in another.

For lubricating metal in contact with metal, use oil; for metal in contact with wood, use tallow; for wood in contact with wood, use blacklead.

As in any other branch of science, or art, no man can turn out enormous quantities of high class work, except by the aid of machinery.

Dry rot, fungi and the wood worm are frequently met with in organs that are boxed up, and each of them shuns the daylight, and ventilation. If possible such should be quickly removed to prevent spreading, and daylight and ventilation be provided. If the wood affected by the worm cannot be removed, treat it with paraffin, and varnish it (without sizing) with hard oak varnish.

The ivories of organ keys are not so liable to turn yellow if well exposed to the light, which is sometimes secured by having glass panels to the sliding doors.

Ivories are bleached by exposure to a strong light, and fuming them with sulphur.

Oak may be darkened to give it the appearance of age by subjecting it to the fumes of ammonia.

In marking organ pipes builders reckon the lower octaves from G to G, as GGG, GG, Gamut G, Fiddle G—Thus FFF is the adjacent (diatonic) note below GG.

In writing to the *Organist & Choirmaster* Mr. Hope-Jones states that "in the organ pipe only half of a sound-wave is developed within. There should be an equal height above, therefore, to allow of the unimpeded development of the other half." Also "It is more easy to control the singing of a large congregation by a small organ placed behind, than by a large instrument in front," arguing that as the members of the congregation situated at the back, sing into the ears of those in front, and pass the tune on to them, the usual eastward position of the organ causes the tone of the instrument to travel "against the grain."

Mr. Hermann Smith in his *Modern Organ Tuning* holds that the stream of air issuing from the windway of a flue pipe is directed outwards, curving and vibrating to and fro as the result of alternating rarefaction and condensation of the air within the pipe, thereby setting up the vibrations.

"*The law of harmonic progression covers two principles, the first is:—That each harmonic successively elicited has an increase of number of vibrations, exactly that of the number of vibrations of the prime-tone, no more, no less.*

The second principle is:—That in the order of ascent from harmonic to harmonic, the intervals between them lessen and lessen, and never repeat."—*Mr. Hermann Smith.*

The *Daily Mail* says that "it is not generally known who has the legal appointment of the Organist, and control of the organ," and that "Mr. Chancellor Dibdin has just declared that these are vested in the Incumbent, as is also the appointment of the Clerk. But there is this difference—that the Clerk's office is a freehold in law, and he can only be dismissed from it for certain specified reasons; whereas the Organist—as well as the Verger, Pew opener, and other officials, who should be appointed by the Churchwardens—is appointed by contract and removable by the terms of the agreement. Many people will be glad to know these points."

“ Organists, as a rule, have a strong belief in the existence of a number of prescriptive rights as necessarily appertaining to their office. The principal of these are:—1. The absolute control of the organ during Divine service, and the selection of the music to be played or sung. 2. Access to the organ at any time, and the use of it for giving lessons to pupils. 3. Authority to permit the practice or performance upon the organ by other persons. 4. Power to forbid practice or performance by any other persons who have not the organist's permission. 5. The sole direction of the choir, if there be no prior understanding to the contrary. 6. The discretion of appointing a deputy during temporary absence.

“ Now, the sooner and the more fully organists are made to understand that they have no real title to these privileges, the better for the position in the future. Every legal right in the organ is divided between the incumbent and the churchwardens. In sad and sober truth the organist has no more power over his instrument—beyond his manipulative and artistic abilities—than the humbler individual who undertakes to supply the wind-chest. The incumbent may shut up the organ altogether during Divine service if he be so minded; he may forbid the performance of any voluntary, chant, hymn-tune, or anthem that may happen, from caprice or any other motive, to displease him; he may appoint any other person to select the music or to conduct the choir, however incompetent that person may be; he may place that person in authority over the organist himself; and, worse still, may insist on the performance of any music to which the organist may have good reason to object as trashy or incorrect. The churchwardens can forbid the use of the organ for giving lessons to pupils, thus depriving the organist of a legitimate and customary means of livelihood; they (the churchwardens) can allow any person they choose to have the full use of the instrument at any time without consulting the organist and in defiance of his wishes; and they can refuse to accept his deputy—while, they can, on the other hand, so long as they pay the stipulated salary, supersede him altogether at a moment's notice. The only right which he possesses in reference to the performance of his duties, is the one which he holds in,

common with the verger or the blower—namely, the recovery of his salary if unpaid and overdue.”—*Musical Standard*.

Information on this subject may be found in a work entitled *The Church Key, Belfry Key and Organ Key*, by Rev. W. H. Pinnock, LL.D., published by J. Hall & Son, Cambridge, 1870. Also *Organs and Organists in Parish Churches*, by William C. A. Blew, M.A., published by William Reeves, 1878.

“When the offices of organist and choirmaster are allotted to different individuals, the holder of the latter chooses the music, we should say. But surely tactful men would work in unison.”—*Musical News*.

In speaking of the pitch of stopped pipes it is usual to make use of the term *tone*, as such pipes are of only half the true speaking length.

In very large buildings it is sometimes necessary to play staccato to avoid overlapping of the tones. But nobody counsels anything but *strict legato* playing in the ordinary way, such being the very essence of good organ playing.

If the pitch (of the organs belonging to their respective manuals) differs at the end of a service or recital, it is wise not to use the manual couplers.

Grease all screws, but never use grease which has salt in it.

After screwing down the upper boards of soundboards, organ builders usually ease the screws back half a turn.

If pipes and woodwork are coated with French polish (instead of size) before varnishing, there is no stickiness afterwards.

Always have two lights to your console—one on each side. A single side-light in an otherwise dark or unlighted Church appears to affect the perspective of the keyboard, creating an optical illusion.

Cork stoppers are best for stopped metal pipes. No stoppers will maintain their places in tropical climates.

For a cheap and simple three manual and pedal home practice organ, the author has devised a harmonium consisting simply of two single row pans, one pan being fitted with a set of narrow reeds, the other having broad reeds. The pallets to the narrow (or reedy toned) reeds are

operated by the upper manual, corresponding both in tone and keyboard to the Swell Organ ; and the pallets to the broad (or flute toned) reeds are operated by the lower manual, corresponding also in tone and keyboard to the Choir organ. The centre manual corresponding to the Great organ has no reeds of its own, but simply acts as a permanent coupler operating the Swell and Choir manuals, (without interfering with their own independent action). This likewise gives a fair representation of the Great organ as to tone and power. The pan of narrow reeds should be fitted with a Swell, and the pedals may be permanently coupled to either the Choir or the Swell (preferably the Choir—broad reeds) ; or better still, be made available with either, and a set of reeds of 16ft. tone added.

The price of a decent pipe organ runs to about £40 per speaking stop, and up to £60 or more for a high-class pneumatic instrument.

Choristers copy organ tone—it is well therefore not to use the reeds too freely in accompaniment, but chiefly for purposes of contrast in tone.

Organists obtain a fine 32ft. effect for a full close by adding the fifth above the lowest (16ft.) pedal (tonic) note.

A Gedact and Gamba combined, yields a very fair imitation of the Clarionet ; but it is not so generally known that a Double (Stopped) Diapason added to the Oboe and Gedact, forms a good Vox Humana, (with the Tremulant, of course).

A Double Diapason and Fifteenth, or Stopped Diapason and Twelfth are sometimes used in single notes at the treble end of the keyboard, to obtain a bell-like effect.

Leather stretches more in one direction than in another, which fact has to be considered in its use.

When a break or change from metal to wood is made in the same stop, the wooden pipe should be two pipes smaller than the metal one would have been.—(*Robertson.*)

“To test an organ for steadiness of the wind supply, draw a fairly full organ, and sustain a treble note whilst playing full detached chords, noticing if the note held fluctuates in power, or steadiness of tone.”—*Organist and Choirmaster.*

"DEDICATION OF ORGAN (suggestion only).—Hymn 484 (Church Hymns); Psalms 98th, 100th, 150th (to bright chants); Magnificat and Nunc Dimittis, Parry in D, *or* Anthem, "Come let us worship," Mendelssohn; Hymn (before Sermon). 319 C.H.; Hymn (after Sermon), 477 C.H.; Hymn (after Blessing), 27, verses 3 and 4 (to be sung kneeling); Amen after Blessing, Sevenfold, Stainer."—*Musical News*.

Church Bells Office also publishes a leaflet, "Form of Service for the Benediction of an Organ."

Tuning.

The Pedal Open Diapason may be tuned to the Manual Open and Principal, being tested by shading it to ascertain if such makes it better or worse.

There is a certain amount of sympathy between kindred stops, tones, scales and pitches, which makes them seek to accommodate each other, and deceive the ear.

A slight tuning of metal flue pipes may be effected by pressing or setting the ears of the pipes inward to flatten, and outward to sharpen, but this method of tuning is scarcely advisable.

Do not remain inside the organ too long at one time, as the heat from the body will affect the pitch, or tuning.

Although solid brass tuning horns or cones are apt to lead to heavy blows, it must be admitted that they spread the metal of the pipe more easily than boxwood cones.

Some tuners prefer tuning the Bass octaves before the Treble, on account of the lesser disturbance to the Treble by tuning the large and heavy work first.

If overhanging speaking fronts are too low, and have lighted gas brackets or lamps beneath the grooving, the pipes to which the grooves belong will temporarily go out of tune.

The beats in tuning being simply the occasional accentuations of the vibrations of two tones or sounds (and their partial tones) not in sympathy with each other, they may be likened to the occasional simultaneous beating of two—or more—pendulums of varying and inalienable length.

. . . "The beatings displayed under temperament *are made by the harmonics* existing in the ground tone. . . . We can ascertain for every interval to a fraction what the *beating rates* should be on an equal tempered scale.

When mid C is 256, the D next to it is in pitch at the rate of $287\cdot35$ vibrations per second, and its fifth above, which is A, is $430\cdot54$. The ratio of a fifth being $\frac{3}{2}$, multiply $287\cdot35$ by 3, product $862\cdot05$, and $430\cdot54$ by 2, product $861\cdot08$; the notes of the interval, therefore, show a difference, '97, as you see, the A is almost one vibration flat. The ratio of the concord is thus disturbed in the near relation of one beat in one second of time."—*Mr. Hermann Smith.*

PITCH. It is somewhat unfortunate that the New Philharmonic fork intended to be used for tuning Concert Pianofortes at a temperature of 68° Fahr. should be the one almost exclusively in use for French pitch in England, being calculated for a higher temperature than most organs are tuned at. When the organ is tuned at a lower temperature than 68° the properly graded fork should be used.

"The only English official standard of pitch is that of the War Office for the military bands. This stands at A = $451\cdot9$."—*Organist & Choirmaster.*

Music is a science of ratios, or of even (not equal) progression to double (or half) rates or measurements at the distance of an octave. Therefore all references to Equal Temperament, or equal distances of semitones, must be taken to mean equal in *ratio*.

The *theoretical* ratio, proportion or relationship of two notes a semitone apart in Equal (even) Temperament, may be expressed by the numbers seventeen and eighteen—that is—as seventeen is to eighteen. This refers to all measurements of lengths of pipes or strings, vibration numbers, or beats in tuning. The number eighteen in the case of lengths of organ pipes would refer to the lower semitone of the two, but in the case of vibration numbers or tuning beats, it would refer to the higher semitone of the two. We may therefore make a rule that in order to arrive at the greater measurement or number from the lesser measurement or number, one-seventeenth must be added; and to obtain the lesser measurement or number from the greater, one-eighteenth must be subtracted. Thus, to ascertain the vibration number of the semitone above, add one-seventeenth to the vibration number of the semitone below;

and to ascertain the vibration number of the semitone below, subtract one-eighteenth from the vibration number of the semitone above. It will be seen that each note must be deduced from its immediately adjacent semitone (below or above,) and becomes in its turn the basis of calculation for the succeeding semitone; each successive semitone forming a new independent basis of calculation.

The chief departure from this ratio of seventeen-eighteen is to be found in the scaling of pipes, which in practice is greatly increased in size in the treble, in order to obtain equality of power.

So called Equal (even) Temperament—unless it is strictly accurate—is a much more serious bar to the refinement of high class music, either vocal or instrumental, than it is generally believed to be. Test it for yourself, and you will find that it is a mistake to make a virtue of necessity. The time will probably come when fixed keyboards, tones and temperament will be abandoned, and instruments will be available in any key in just intonation, the pitch, notes, intervals, chords and expression, being determined by the performer, as in the case of the violin or slide trombone. The pitch of each note, interval, or chord being absolutely under the control of the performer, each chord or musical sentence will be (in just intonation) a law unto itself, uninfluenced by temperament, or the necessities of any other keys or modes than the one immediately in use, the note or notes common to both chords or keys (which is or are essential to good modulation) forming the basis of derivation for the new harmony, chord, or key, in just intonation. Even in the case of a transition, there is one note common to both keys.

Some however contend that Equal (even) Temperament is a necessity in modulation, in order that notes arrived at by different routes or sources shall be in tune, which, it is stated, would not be the case without the aid of temperament. Much can be said for both sides of this question.

Alteration and Reconstruction.

If the keys are merely shifted towards the Bass end and the positions of the pipes remain unaltered, the scaling of

all the stops will be increased *en bloc*, the open pipes being afterwards cut down to pitch, and revoiced.

Working Specification.

Instead of accepting a "commission" the organ expert should be recompensed for his trouble by the payment of an agreed sum, which should not be fixed by the amount of the contract, as that is offering him a temptation to spend more money than may be necessary, and tends to increase the amount of any estimate made either by the organ builder or the expert.

R.C.O. Resolutions and Recommendations.

On October 25th, 1902, the following announcement appeared in *Musical News* :—

"THE ROYAL COLLEGE OF ORGANISTS.—The Council of the Royal College of Organists have decided, in view of the great advances which have been made in organ construction in recent years, to withdraw the 'Rules and Recommendations' issued after the Organ Conference held in 1881. The same spirit of wise moderation which influenced the College authorities in connection with this matter, to the avoidance of any course of a too assertive or arbitrary nature, is clearly manifested in the present decision."

In view of the above decision, and in the absence of any authoritative statement, the attention of organists, organ-builders, and others interested, may, in the meantime, be directed to the following attempt to sum up the situation.

For some time past it has been a kind of open secret amongst organists that these "Resolutions and Recommendations" required revision and modification, in order to be in accordance with recent improvements and certain opinions and decisions; also to satisfy a general feeling that greater comfort in playing modern organ music upon modern organs could thereby be secured.

The modern organ is employed in two distinct capacities :—
(1) As an instrument for the accompaniment of choirs or voices; (2) as a solo, orchestral, or concert instrument.

Considering the organ from a vocal point of view, the old FFF manual compass downwards seems to agree (an octave lower) with the usual downward limit of the bass voice, which for ordinary purposes may be taken to range from the F below the bass stave to the D above the first ledger line above the stave. This portion of the pedal board

should certainly be situated centrally for comfort in playing. For a simple accompaniment to Hymn Tunes and Chants, the lower five notes of the pedal board (CCC to E) are not required,—but much desired.

The F to F (five octaves) manual compass is now frequently preferred for instruments of the free reed class without pedals, and it gives a central position with regard to the entire vocal range over the four voices, say from F below the bass stave to the G above the treble stave, but the centre of this compass (F to F) does not agree with the centre of the compass of the pianoforte, nor with the centre of the CC to G organ manual compass, which gives a central note or point somewhat similar to that of the pianoforte.

The retention of this common centre may or may not be of importance, but unquestionably some performers feel awkward when seated in the centre of a five octave F to F instrument, and naturally shift their position more towards the treble end.

A pedal board of 30 notes, having F for the lowest note, would not give a central position on the pedals for the before-mentioned vocal bass range (F to D).

The FFF pipe organ manual compass has long been discarded, and possibly could not easily be reached (under modern conditions) with more than two manuals, and its actual pitch has been relegated to the pedal organ proper.

The CC to G (56 notes) manual compass, whilst retaining its agreement with the pianoforte as to a common centre, likewise gives the performer a fairly central position with regard to the entire vocal range over four voices.

A pedal board of CCC to F (30 notes) compass, if placed *centrally* (instead of having C under C) to a CC to G keyboard, also gives a fairly central position with regard to playing the vocal bass (F to D); but for this vocal bass to be perfectly central the compass of the pedal board requires to be from CCC to G, (32 notes).

Recent organs have a manual compass of five octaves, CC to C (61 notes,) which, to keep a fairly central vocal bass position on the pedals, *demand*s a CCC to G pedal board (32 notes).

The centre of this five octave CC to C manual compass would seat a performer somewhat more towards the treble than a pianist would seek, but the modern method of leaving the bass part in organ music to be played by the feet, and the use of high left-hand parts, do away with the necessity for a very low manual compass, and suggest that the performer *should* seat himself somewhat more towards the treble end; and the probability is that a performer playing pedal obbligate organ music on a pedal pianoforte, would unconsciously take a position more to the right than when playing pianoforte music pure and simple.

It must however, be distinctly understood that a five octave CC to C manual compass does not give the performer a central position for the hands with regard to the entire vocal range over the four parts; but it gives him a position for the treble, alto, and tenor parts, and, with a pedal board of 32 notes (CCC to G), a central position on the pedals with regard to the range of the vocal bass.

Memorandum:—A pedal board of 32 notes placed centrally to a manual compass of five octaves (CC to C) gives practically the same position as a pedal board of 30 notes placed centrally to a manual compass of 56 notes (CC to G), the additional notes upon the manuals in the former case giving the space (roughly) for the two additional notes on the pedal board.

It may be well to note that the tendency of the adoption of the low Continental or French pitch, will be to cause the vocal parts to rise in notation.

The instrumental capacity of the organ simply requires an extension of compass, which, in a modern CC to C organ with proper pedal stops, is provided for by the extension upwards of the manuals to C (which can be reached when the performer is seated somewhat to the right), and downwards by pipes of low or deep pitch upon the Pedal Organ.

A possible objection to a manual compass of five octaves, CC to C, may be that middle C is two octaves from one end of the keyboard, and three from the other; but it is balanced in *pitch* by the Pedal Organ. Another objection is, that the extension of the compass (upwards) consists entirely of small pipes; this also is balanced in pitch by the Pedal Organ.

The starvation of the Pedal Organ ; the difficulty in reaching the upper pedal notes—or rather the facility for reaching the lower notes—with a C under C organ, and the reservation of the right foot for the operation of the swell pedal, are no doubt responsible for some heavy left-foot pedalling ; necessitating frequent undesirable inversion of intervals in the bass. When heavy pedalling is desired, it is of course much better achieved by having the pedal Bourdon or Open capable of being used in actual 32-feet pitch down to the low F, the lowest five notes being obtained acoustically by coupling in fifths, (or by a Great Quint,) thus enabling the performer to play the music as it stands.

Now with regard to the question of parallel or radiating pedals ?

Parallel pedals were probably advocated in order that the distance of wide skips (as octaves) should remain the same at both the toe and heel end of the pedals.

But the instinctive idea of distance by the brain, reverts to the joint of the thigh, and the *same amount* of lateral movement at the joint, results in radiation, as the leg is extended towards the sharps.

The greater space between the sharps given by radiation allows of greater ease in playing adjacent sharps with alternate feet. In playing adjacent pedal naturals the same amount of space is not required, as owing to the length of the natural Pedal keys, one foot can pass (or take a position) behind the other, which cannot be done on the short pedal sharps. There is however the disadvantage of not being so well able to play two adjacent sharps smoothly with one foot, (as is sometimes done by rolling the foot from side to side). The natural pedal keys being long in comparison with the sharps, adjacent naturals are capable of being played with the toe and heel of one foot, and therefore may be closer than the sharps, which is an additional argument in favour of radiation : nor does the heel of the boot require so wide a scale or gauge as the broader portion of the toe.

I believe it will be generally found that those who prefer parallel pedals, do so because they are accustomed to them. Putting all these things together, and looking at the

matter from a general and practical point of view, and also taking into consideration actual measurements which are comfortable to the performer, we may, without being in any sense dictatorial, arrive at the following conclusions, and make some suggestions respecting some of the more important points—all of them being subject to criticism, alteration, revision, approval, or disapproval:—

That the compass of the manuals be five octaves, CC to C (sixty one notes).

That the compass of the pedals be from CCC to G (thirty-two notes).

That (in order to be in agreement with the above,) the pedal board of organs of CC to G manual compass should not exceed thirty notes (CCC to F) in compass.

That in all cases the pedal board be fixed practically central, giving (about) middle D on the pedals under the D on the manuals.

That the pedal board be concave and radiating, having a radius of ten feet six inches from a central point to the back or far end of the pedal sharps; the pedals, however, to be reduced in thickness to five eighths of an inch or even half an inch when finished, and to leave a clear space of three and three quarter inches between alternate naturals (when the intervening natural pedal is depressed,) at the (radial) centre of the radial length of the pedals.

That the measurements of pedals *from centre to centre* are somewhat misleading in actual practice, as to the room they give for the foot, unless the *thickness* of the pedals is also given. (The broad part of the sole of an ordinary boot is about four inches.)

That the fronts of the pedal sharps will naturally form an arc of a circle; the sharps to slope upwards towards the back, in continuation, as it were, of the slope to which they wear in practice.

That making the pedals five eighths of an inch thick instead of three quarters of an inch thick, will reduce the total width of the pedal board, and bring the extreme pedals nearer.

That for a two manual organ (lower manual, Great organ; upper manual, Swell organ) the following measurements be

adhered to: the upper surface of the middle D on the pedals to be thirty inches below the upper surface of the great organ naturals. The front end of the sharp belonging to the middle D sharp on the pedals to be four and a half inches further back than the fronts of the great organ sharps.

That for a three manual organ (centre manual, Great organ,) the pedals to be thirty-one and a half inches below the upper surface of the great organ naturals, and the front end of the sharp belonging to the middle D sharp on the pedals, to be two inches further back than the fronts of the great organ sharps.

That manual keys overhang one and a half inches, and be two and three quarter inches from top to top (instead of three inches).

That if a swinging-rod swell pedal is used, it is to project from the treble end jamb, and the top of the swell pedal when the swell is closed, is to leave nineteen inches clear for a two manual organ, and eighteen inches clear for a three manual, between that and the underside of the woodwork the keys rest upon.

That the swell pedal and swinging-rod stand (diagonally) at such an angle on plan, as will agree as nearly as possible with the arc of a circle three inches (clear) further back than the fronts of the pedal sharps. The same with regard to the Tremulant pedal.

That the end of the swell pedal (with the D under D position of the pedal board) and thinner (five eighths of an inch) pedals, is not to project further from the treble jamb than over the D on the pedal board.

That the toe end of the swell pedal shall describe an arc of a circle of large radius.

That the swell shutters be operated by a contrivance similar to the cow-heel movement, to ensure a gradual crescendo and decrescendo.

That organ builders and organists consider the desirability of balanced swells having two footboards, one for each foot, instead of retaining a central footboard, or that the central footboard be longer than is now usual.

That thumb pistons and composition pedals increase in power from left to right.

That all composition pedals be double acting and self recovering; and that the toe ends of all such pedals, and

those of other pedal movements, shall follow out the correct lines of radiation, arc and concavity, as do the pedal sharps, at a distance of six inches clear above the pedal sharps, and four and a half inches clear further back than the front ends of the pedal sharps.

That all drawstops be made smaller than is now customary, that they project from the jambs half an inch when closed, that the amount of travel be less than is now usual, and that the manual drawstops be grouped as nearly as possible opposite the manual to which they belong; the flue work to be arranged in the order of gravity of pitch; likewise the reeds above the flue work.

That organists and organ builders consider the desirability of actuating all sliders pneumatically instead of mechanically, so as to be available for combination by means of pistons instead of by composition pedals; and for ease of manipulation by hand.

That all couplers be grouped with the stops belonging to the department they augment, as in Mr. Casson's system.

That all Pedal drawstops (or at least the Manual to Pedal couplers) be duplicated to draw on both jambs, or that movements providing a suitable bass be employed.

That the Great to Pedal coupler be available by a reversing pedal movement.

That all drawstop knobs and drawstop jambs be placed diagonally.

That in organs having more than two manuals, the music desk be brought forward; and that in all cases it be large and flat in surface; be inclined to a reasonable angle; the ledge to be three inches wide, and to leave six inches clear from its underside to the swell manual of a three manual organ.

That the organ stool be not less than twelve inches wide; the edge next to the organ to be well rounded, and to form an arc of a circle on plan; and, (if not made to be adjustable as to height,) the top or upper surface of the stool to be twenty and a half inches above the upper surface of the middle D on the pedals; and the edge of the stool at the back of the performer to be a quarter of an inch higher than the other edge, so as to give a slight tilt or inclination to the top.

That the woodwork between the performer and the lowest manual, be reduced to the narrowest possible limit, and if necessary be bevelled away beneath.

That organ builders and organists consider the desirability of giving the pedal-board an inclination or tilt upwards at at the toe end, or of making the pedals concave from toe to heel, as well as from left to right.

That good tracker action may be employed for organs of less than twenty speaking stops.

That the Pedal Organ shall provide a suitable bass, and a contrast, to the tone upon the manuals.

That the Choir Organ be placed in a swell box, having shutters on two sides if possible.

That organ builders employ a larger proportion of wood flue work on the manuals than is now customary, and that no zinc pipes be used of a less length than the 4ft. C, (Tenor C).

That, in addition to large wind trunks, concussion bellows be employed in small organs, and separate reservoirs in large organs, to steady the wind.

That the voicing of the organ be finished in the building the instrument is to occupy.

That the Tremulant be operated by a hitch-down pedal projecting from the bass or left-hand jamb; the action of the pedal to temporarily cut off the concussion.

That the Tuning of the organ be that known as Fine, Equal (even) temperament tuning, the beats or pulsations quickening as the pitch rises; the tuning to stand such tests as major tenths in chromatic succession, etc.

That the Pitch of the organ be $A=435$ ($C=517.3$) vibrations per second at 59° Fahr.; which is equivalent to $A=439$ ($C=522$) in Equal (even) temperament at 68° Fahr.; and that if the organ is tuned at any other temperature, a properly graded tuning fork should be used.



Since the foregoing article first appeared in print, I have experimented with a set of three manuals and a CCC to G concave and radiating pedal board, and have come to the conclusion that it would be an improvement on the measure-

ments previously given in some of the Musical papers, to set the Pedal board a little farther back, (being actually the same *for a three manual organ*, as that originally set by the Council of the R.C.O.) and have altered them (and the radial length for setting out the pedal-board) in this reprint accordingly. (T.E.)

On March 14th, 1903, the following letter appeared in *Musical News* :—

STANDARDIZATION—A PRACTICAL SUGGESTION.

TO THE EDITOR OF "MUSICAL NEWS."

SIR,—May I suggest a practical method of advancing the much vexed question of Organ Console measurements ?

Let there be built an adjustable console (of two or three manuals,) *i.e.*, one in which each constituent part shall be capable of independent adjustment to the various requirements of individual performers.

Then, distributing the parts for each performer, invite a large number of organists (of average stature) to try this console, each one making his own comfortable adjustment, without the aid of measurements. The arbitrary positions set by each performer to be carefully ascertained and noted in a book, properly ruled for each measurement, before redistribution of the parts for the next person. Then take the average of the measurements recorded for each measurement required, and let a standard model be constructed.

Would it be expecting too much to ask if the R.C.O., as guardians of this branch of the profession, would have such a contrivance built, and placed in their hall for testing ?

THOS. ELLISTON.

Casson's System of Organ Building.

INVENTIONS OF MR. THOMAS CASSON.

1—1868. A simple pneumatic action whereby on applying slightly greater or less pressure to the swell keys the largest swell box has its shutters opened, closed or stayed at any point.

2—1876. A melody attachment worked through the "Barker" pneumatic lever in tiers, with alternative harmony.

3—1876. A development of this melody arrangement by which one could play in four parts on any of four solo stops, any stop or stops taking Treble, Alto, Tenor or Bass severally.

4—1882-3. "Pedal Help" system; instantaneously to provide the proper pedal bass and coupler for any combination of manual stops and couplers. Consisting in a separate group of pedal stops and couplers for each manual department, the actual stops "duplicated" where necessary. Each group being prepared by hand or combination action the touching of a stud called a "Help" brought on the group required and detached the group or groups not required. Coupling any two manuals coupled the pedal groups of the manual thus augmented.

5—1882. Grouping, specifying and controlling all couplers as stops of the division which they augment.

6—1882. The economical provision of proper pedal basses by using the lower octave and a half of manual stops, by borrowing, as the upper octave and a half of the correlative pedal stops.

7—1882. The provision of stops by this method to supply proper basses for the swell, enclosed in the swell box. Proper basses for the Swell were anticipated by Walcker about 1866, as acknowledged in Mr. Casson's "Modern Organ," 1883.

8—1882. The use of one octave only of Acoustic Quint bass for the pedal, using by borrowing an existing 16ft. stop in 32ft. pitch for the upper octave and a half of pedal; thus avoiding the offensive effect of the Quint, and its failure to create a 32ft. effect, in the upper range. The same with a 21½ft. Quint and 32ft. stop for 64ft. effect. Use of one octave of Quintatön in similar fashion, 1898.

9—1882. Compound swell pedal, governing the shutters of two swell boxes in perfect independence by one foot.

10—1882. Retaining Pedal; producing the same effect as the stop-switch but in less convenient form.

11—1884. Unisonal duplication of manual stops and couplers.

12—1888. Octave duplication of stops, i.e. provision of a secondary group (say Choir) of one or more stops of a primary group (say Great) on the same manual. The secondary group acts in conjunction with the octave coupler

action, the stops "duplicated" in the secondary group are thus in octave pitch relatively to the primary group. The groups are switched on alternatively by studs, etc., termed "Manual Helps."

13—Patented 1889. The embodiment of all the features of 4, 5, 11, 12 in the electric portion of the electro-pneumatic organ. This necessarily involves the use of 14.

14—1889. The electric stop-switch for electro-pneumatic organs.

15—1892. "Unison silent" stop.

16—1894. A more convenient though not more efficient form of "Pedal Help." Each manual has a "Help," on touching which the drawstops of a single group of pedal stops and couplers at once move into the correct bass of the respective manual. On coupling two manual departments the basses of both are provided by the Pedal Help of the augmented division. A pedal help having been once touched, the proper bass will follow *all* changes of its manual, if desired, until another pedal help is touched.

17—1894. An improved pneumatic melody and double-bass action, with alternative harmony by a longitudinal chest and self-rising clacks.

18—1895. Embodiment of No. 16 in the useful "Positive" organ.

19—1898. Means for emphasizing the melody or bass to any greater or less degree on a single set of free reeds.

20—1898. Means for emphasizing the melody or bass of Pianofortes or Free-reed instruments self-played by perforated paper rolls or by barrels.

21—1899. A pedal solo organ distinct from the pedal-bass organ. A solo combination being drawn, the pedal-bass organ can be switched off for entry of the pedal-solo, and *vice versa*. Thus it is as easy to take up a solo (say a *Canto Fermo*) on the pedal as on the manual and as easily to resume the pedal bass when wanted.

22—1903. Improved quick-speed melodic and double-bass action with alternative harmony.

23—1903. Pneumatic levers causing ordinary pallets to act as relief pallets.

24—1903. Making wind-tight pneumatic soundboards of the Roosevelt type.

Austin's System of Organ Building.

Air has no normal state like water, which is incompressible, a current (wind) being always induced. Air density at earth level is entirely artificial, and is induced to flow to a lower density; a current in a trunk or groove does not *flow*, except to a lower density; and this is diminished step by step as the outlet is enlarged by means of additional stops being drawn; the faster the current, the lower the pressure.

As a stop is drawn and a key depressed, the wind from the storage in the bellows flows through the trunks and grooves to its ultimate exit through the pipe, but first of all the pressure has fallen in the channel sufficiently to induce this current.

The tone of a pipe becomes weaker and lower in pitch when the density or pressure of the air or wind conveyed to it diminishes; this is especially noticeable in the upper octaves and Chorus-work, and is known by the name of "robbing."

When this takes place tuners adopt the method of tuning chorus stops with the foundation stops drawn.

Organ builders have hitherto obtained a comparatively steady wind by multiplying the number of windchests and reservoirs, and by placing but few stops over one pallet; which is expensive.

An erroneous idea has probably been conveyed by the previous contribution, that the windchest and the body of air must necessarily be large. The fact is that in order to obtain a perfect result, it is the *capacity* which should vary, and not the current.

This is provided for in the Austin system by the large and active pressure board, which, when used in connection with blowing machinery having automatic inlet control, scarcely ever moves more than about two inches. (See "Bellows," Addenda II.)

For "one outward folding rib" on page 260 *read* "a single pair of inward folding ribs."

Vocabulary of Stops.

CLARION MIXTURE. A flue-work Mixture of horn-like or clarion tone.

GEDACT, GEDACKT OR GEDECKT. A (metal) stopped diapason having a hole through the stopper. The latter name is not only good modern German, but conveys the English meaning of "decked" or covered.

GRAVE MIXTURE. A Mixture consisting of the lower partial tones.

GREAT QUINT. A fifth. A set of pipes speaking a fifth above the Diapason, or predominant pitch.

HARMONIC BASS. A misnomer for Acoustic or Resultant Bass, of 32ft. tone.

LIEBLICH FLUTE. Same as Lieblich Gedact, but of 4ft. tone.

RESULTANT BASS. Another name for Acoustic Bass.

STENTORPHON. Not a *reed* stop (as previously stated) but a very powerful flue stop (sometimes made of tin) having the windway all round the pipe, like a steam whistle, and of heavy, full, diapason tone. Example in the large four-manual organ by P. Conacher & Co., at the residence of H. G. Harris, Esq., Castle House, Calne, Wilts.

VIOLES CELESTE. A celeste of Gamba, Viol or string tone, as distinct from the (Dulciana) Voix Celeste.

Vocabulary of Technical Terms.

Adjustable Composition pedals or Combination pistons Are those which are capable of being set or altered to any combination required, by the performer.

Bearded Gamba. A Gamba having a frein, bar or roller across the mouth of the pipe.

Cast. A term applied to woodwork when it is warped, bent or twisted. To run liquid pipe metal into sheets on the casting bench.

Celestial Organ. Another name for Echo Organ.

Combinational Tones. Resultant tones.

Dead centre. Applied to the position of a crank when the centre of the crank is in line with the source of energy, and is consequently powerless to convey the motion.

Dead in tune. Without pulsation, wave or beat.

Diapason Normal Pitch. $C=517.3$ or its equivalent.

Doll head Coupler. Similar to a Drum coupler.

Double acting Composition pedals Are those which at the same time both draw and close any stops required, in order to form the combination set.

Double rising frame Of a bellows or reservoir refers to the floating frame for two pairs of (inverted) ribs.

Drawing. Pipes nearly identical in scale, length and pitch, are said to draw, when they assimilate or accommodate the pitch in sympathy with each other.

Drawknob. The handle of the drawstop.

Extension System. Refers to an additional octave of pipes beyond the compass of the clavier, enabling the pipes to be used in octaves throughout the compass of the manuals, or as an independent stop of octave, or sub-octave pitch.

Extreme Keys. Those far removed *by order of succession of keys* from the key of C, necessitating the employment of numerous sharps or flats, as those of B major, D flat major, etc.

F.F.F. The F below CC.

Fly pallet. A kind of trap-door valve or pallet.

Frein. The bridge, roller or bar across the mouth of a pipe of small scale, and string tone.

French Feeder. A square (*i.e.* not diagonal) double feeder, the *middle board moving* and blowing or compressing the air in both directions as mentioned on page 4. Sometimes placed in a vertical position. The definitions previously given refer, in error, to square rising *reservoirs*.

GG. The G below CC.

Heavy pressure reeds. Are those on a high or heavy pressure of wind.

Hitch-down pedal. One which is capable of being held down to its fullest extent by means of a swinging-rod, (or notch,) as in the case of the Swell Pedal, or Tremulant.

Humming. The sounding of a pipe or pipes by ciphering, or running of wind along the slide.

Incomplete Stops. Are those of less than full compass.

Inverted ribs Of a bellows or reservoir are so called when one pair of ribs fold inwards, and the other pair outwards. (See "Bellows," Addenda II.)

Kegellade. A cone-chest of conical porcelain pallets, as found in Germany, in ventril soundboards—(*Robertson*).

Leathered lips. Refer to the upper lip of a flue pipe being covered with leather, which influences the tone.

Mean Tone. An obsolete system of tuning, in which certain notes were tuned as mean notes (between two other notes or intervals); virtually unequal temperament.

Mutation work. Strictly speaking refers to (harmonic) sounds in Mixture-work, other than octaves to the ground tone of the key pressed down.

New Philharmonic Pitch. $A=439$ used for Concert Pianofortes subjected to a temperature of 68° Fahr.

Primary. A windchest placed directly behind the key in pneumatic work.

Pull down plate. The metal plate through which the pull-down wire passes.

Purse. A slack leathern air-tight covering to a hole through which the pull-down wire, or a similar movement, passes.

Recessed pallets. Are so called when they are set back from the main line of the front of the soundboard.

Relay system of pneumatics. Refers to a system by which a motor of small dimensions operates a larger one in turn.

Remote Keys. Same as Extreme Keys.

Robbing. The result of an insufficient supply of wind, caused by pipes being placed too near to each other; the pallet being insufficiently open; or by structural defect, or incapacity.

Rocking beam. The beam of an engine or hydraulic motor operating the pointed rods and square feeders.

Scored. The term for the chasing of upper boards (See "Soundboards and Windchests").

Screw bars. The thick bars of a windchest or soundboard intended to form screw-holds.

Self recovering Composition Pedals. Are those in which the iron pedal recovers its normal position by means of a spring, instead of remaining depressed after use until another composition pedal or a stop is moved.

Short Octaves. In ancient C organs there were no CC *sharp* pipes, but the CC *sharp* key was utilized for sounding an AA pipe, the octave below the lowest A on the manual; so that when this CC *sharp* key and the A above were held down, the octave was sounded. Frequently another key was added immediately below the CC key, corresponding to B *natural*, which sounded GG, the octave below the lowest usual G key on the manual.

At that period, owing to the use of Unequal Temperament tuning, extreme keys were not in use, therefore these keys were not required as the Tonics of D flat, or B major.

Single acting Composition Pedals. Act only in one direction, either *drawing* or *closing* the stops.

Splayed jambs. Refer to Diagonal drawstop jambs.

Square, Square-lift or Square-drop Feeders.
Are those having parallel ribs on all four sides, like the reservoir, —not hinged at one end—not diagonal.

Strained Sheepskin is the term used for organ leather which has been thickened, *i.e.* reduced to an even thickness.

String-toned Stops. Those of the Gamba or Viol d'Orchestre tribe or family.

Tracker-pneumatic action. A combination of light tracker work and pneumatic levers or motors—the tracker work operating the motors and taking the place of the tubes in tubular pneumatics.

Tube-block. The wood bored to receive the tubes in tubular pneumatic work.

THOMAS ELLISTON,

SIAM HOUSE,

SUDBURY, SUFFOLK.

November, 1903.

This book sh

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